NOVEMBER 1987
Issue #326

# 73® Amateur Radio

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A WGE Publication

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**Steer Your Beam** p. 44

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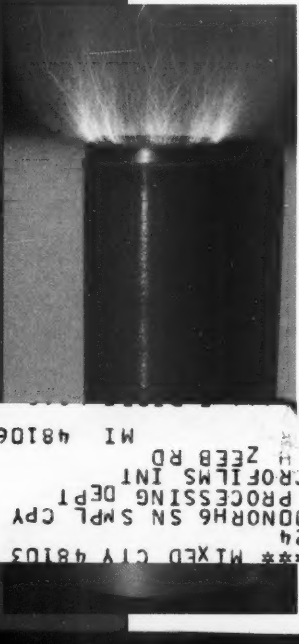

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*** MIXED CTY 48103
424
300NORH6 SN SMPL CPY
PROCESSING DEPT
CROFILMS INT
H ZEEB RD
MI 48106

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# ICOM IC-751A

## "IT'S WHAT'S INSIDE THAT COUNTS!"

- **All HF Band Transceiver / General Coverage Receiver**
- **Advanced Circuit Designs**
- **All Modes Built-in USB, LSB, FM, AM, CW, RTTY**
- **Superb Frequency Stability**
- **Continuous Duty Operation**
- **Crystal Clear Signal Quality**

**Midsize Masterpiece!** The deluxe IC-751A includes more high performance features and professional circuitry per cubic inch than any other HF transceiver. Its smooth-as-silk operation and long-term reliability produce the ideal contesting, DX'ing, mobiling and portable rig. Owning an IC-751A truly means "Going First Class!"

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**All Bands, All Modes Included.** Operates 160 through 10 meters, it's easily modified for MARS operation, plus it includes general coverage reception from 100kHz to 30MHz. No compromise, no comparison!

**32 Tunable Memories.** Store both frequency and mode information. Use them to quick-access your favorite spots or as 32 preferred frequency-remembering VFOs.

**A Modern Amateur's Delight!** Special attractions include an electronic keyer, semi or full break-in rated to 40 WPM, panel selectable 500Hz/FL-32A CW filter, and volume control-tracking sidetone. SSB transmissions are enhanced with an RF speech processor and tone control to produce sparkling clear audio. PLUS there's a new rubberized tuning knob for velvet-smooth tuning and a full line of accessories and filters.

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**All stated specifications are approximate and subject to change without notice or obligation. All ICOM radios significantly exceed FCC regulations limiting spurious emissions. 751A187**

# THE ALL NEW PRIVATE PATCH IV BY CSI HAS MORE COMMUNICATIONS POWER THAN EVER BEFORE

- **Initiate phone calls from your HT or mobile**
- **Receive incoming phone calls**
- **NEW!** **Telephone initiated control. . .**
  - ✓ **Operate your base station with complete control from any telephone**
  - ✓ **Change frequencies from the controlling telephone**
  - ✓ **Selectively call mobiles using regenerated DTMF from any telephone**
  - ✓ **Eavesdrop the channel from any telephone**
  - ✓ **Use as a wire remote using ordinary dial up lines and a speaker phone as a control head.**

DIAL ACCESS REMOTE/INTERCONNECT
Private Patch IV
DTMF
COS
CON
DISC
CSI CONNECT SYSTEMS INC.
POWER

The new telephone initiated control capabilities are awesome. Imagine having full use and full control of your base station radio operating straight simplex or through any repeater *from any telephone!* From your desk at the office, from a pay phone, from a hotel room, etc. You can even change the operating channel from the touchpad!

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The importance of telephone initiated control for emergency or disaster communications cannot be overstated. Private Patch IV gives you full use of the radio system from any telephone. And of course you have full use of the telephone system from any mobile or HT!

To get the complete story on the powerful new Private Patch IV contact your dealer or CSI to receive your free four page brochure.

Private Patch IV will be your most important investment in communications.

✓ = **NEW FEATURE**

- ✓ */# or multi-digit connect/disconnect
- ✓ Fully regenerated tone dialing
- • Pulse dialing
- • Toll protection
- • Secret toll override code
- • Busy signal disconnect
- ✓ Dialtone disconnect
- • CW identification
- • Activity timer
- • Timeout timer
- ✓ Telephone initiated control
- ✓ Regenerated DTMF selective calling
- • Ringout
- ✓ Ringout or Auto Answer on 1-8 rings
- • Busy channel ringout inhibit
- ✓ Status messages
- ✓ Internally squelched audio
- • MOV lightning protection
- ✓ Front panel status led's
- ✓ Separate CW ID level control
- ✓ 24 dip switches make all features user programmable/selectable.

- ■ Connects to MIC and ext. speaker jack on *any* radio. Or connect internally if desired.
- ■ Can be connected to any HT. (Even those with a two wire interface.)
- ■ Can be operated simplex, through a repeater from a base station or connected directly to a repeater for semi-duplex operation.
- ■ 20 minutes typical connect time
- ■ Made in U.S.A.

### OPTIONS

1. ½ second electronic voice delay
2. FCC registered coupler
3. CW ID chip

**CONNECT SYSTEMS INC.**
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Torrance CA 90505
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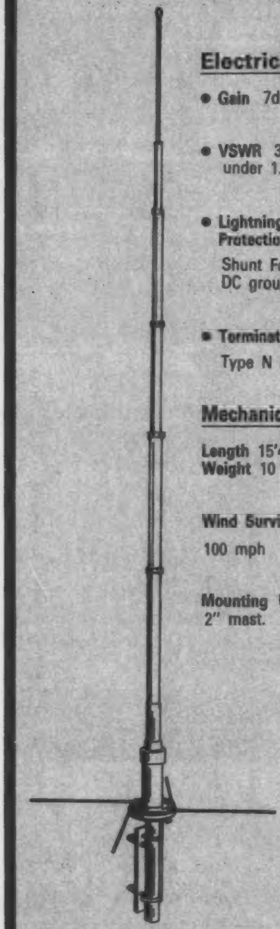
**CIRCLE 12 ON READER SERVICE CARD**

# HUSTLER®

**Hustler VHF and UHF antennas offer a combination of gain, durability and value which have made them the antenna most often demanded for repeater applications.**

***Reliability and Performance - Beyond Your Expectations***

## G7 - 144



**Electrical**

- **Gain** 7dBd
- **VSWR** 3 MHz under 1.5:1
- **Lightning Protection** Shunt Fed - DC ground
- **Termination** Type N Female

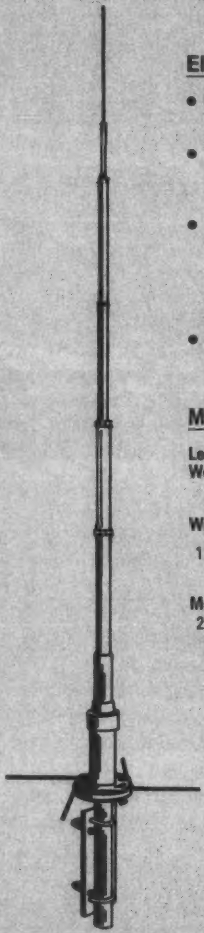
**Mechanical**

**Length** 15'4"
**Weight** 10 lbs.

**Wind Survival**
100 mph

**Mounting** Up to 2" mast.

## G7 - 220



**Electrical**

- **Gain** 7dBd
- **VSWR** 4 MHz under 1.5:1
- **Lightning Protection** Shunt Fed - DC ground
- **Termination** Type N Female

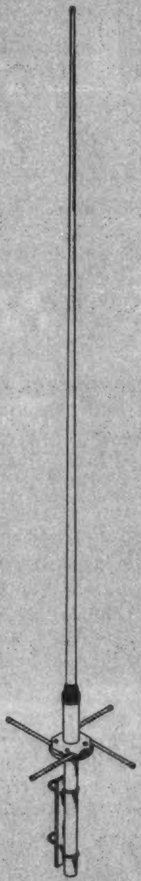
**Mechanical**

**Length** 10'2"
**Weight** 7.0 lbs.

**Wind Survival**
110 mph

**Mounting** Up to 2" mast.

## G6 - 440



**Electrical**

- **Gain** 6dBd
- **VSWR** 8 MHz under 1.5:1
- **Lightning Protection** Shunt Fed - DC ground
- **Termination** Type N Female

**Mechanical**

**Length** 7'3"
**Weight** 16 lbs.

**Wind Survival**
125 mph

**Mounting** Up to 2" mast.

**HUSTLER, INC.** • One Newtronics Place • Mineral Wells, Texas 76067 • **(817) 325-1386**

CIRCLE 269 ON READER SERVICE CARD

# MFJ-931 creates artificial RF ground with random wire *also*, electrically places far away ground *directly* at your rig

NEW

ARTIFICIAL GROUND
CAPACITANCE
MFJ

MFJ-931
$79^{95}

- **Creates artificial RF ground with random length wire**
- **Electrically places a far away ground directly at your rig**
- **RF ammeter makes tuning for maximum RF ground current easy**
- **Eliminates "RF bites", RF feedback, TVI/RFI and other problems due to inadequate RF ground**
- **Improves radiation pattern distorted by poor RF ground**

Don't we all sometimes have problems getting a good RF ground?

Unpleasant problems. Problems like RF "hot spots" that "bite" our lips or fingers when we transmit; like RF feedback that causes our rigs to quit working on certain bands; like excessive RF coupling to AC lines that causes everything to quit working; like our neighbors screaming about TVI and RFI; like our computers computing jiberish; or like being unable to talk across town because of extreme ground losses or radiation pattern distortion.

"Hey, my rig is on the second floor. There's no way I can get a good ground," you're thinking, or "I already have an excellent ground but the long ground connection wire causes reactance and acts like a high impedance circuit, isolating my rig from true RF ground."

### What to do

**Use the new MFJ-931 to create an artificial RF ground!** It resonates a random length of wire thrown along the floor and produces a tuned counterpoise. This artificial ground effectively places your rig near actual earth ground potential even if your rig is on the second floor or higher with no earth ground possible.

**Also, the MFJ-931 electrically places a far away RF ground directly at your rig -- no matter how far away it is.** The MFJ-931 reduces the electrical length of the ground connection wire to virtually zero by tuning out its reactance.

### How it works

The MFJ-931 connects between the ground connection of your transmitter or antenna tuner and a random length of wire thrown along the floor. Two knobs are adjusted for maximum RF ground current using its built-in RF ammeter. This resonates the random wire, converts it into a tuned counterpoise and presents an effective low impedance near ground potential to your rig, thus creating an artificial RF ground.

To electrically place a far away ground directly at your radio equipment simply connect the MFJ-931 between your rig and the connecting ground wire and adjust its two knobs for maximum RF current using its RF ammeter. This tunes out the reactance of the connecting wire, reduces the electrical ground lead length to virtually zero and electrically places your far away ground directly at your rig.

### Get an effective RF ground

Get an effective RF ground. Eliminate "RF bites". RF feedback TVI, RFI and many other annoying problems due to inadequate RF ground, *and* -- at the same time --improve your radiation and radiation pattern for more DX.

The MFJ-931 covers 1.8 to 30 MHz and has a built-in RF ammeter for indicating RF ground current. It's ruggedly built in an all aluminum cabinet with a brushed aluminum front panel and measures 7½x3½x7 inches. It comes with a one year unconditional guarantee.

It's available only from MFJ. MFJ-931, $79.95.

**Order any product from MFJ and try it -- no obligation. If not satisfied return within 30 days for prompt refund (less shipping).** • One year unconditional guarantee • Add $5.00 each shipping/handling • Call or write for free catalog, over 100 products.

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# NEVER SAY DIE

*Wayne Green*

### QUALITY CONTACTS

Are a large percentage of your contacts with turkeys? Worse, are the guys you're working thinking exactly the same thing? Well, it's been a while since I've written about how to make your contacts more interesting, so perhaps you've forgotten—or, worse, weren't paying attention in the first place.

How many chaps go out of their way to tell you how much they've enjoyed a contact with you as you're signing off? Haven't heard that for a while, eh? I thought not. Well, there's a secret to making contacts fun for the other chap—and for yourself. Once you know what it is, you'll seldom have a dull contact—at least for the chaps you're working—and probably not for you either.

All of us get hung up in habits. Our basic mike (or key) fright makes it so we tend to stick to a formula contact—one which we have down pat and allows us to go on the air and make QSO after QSO without ever having to think. You may have some trauma when you first try to break this habit—after all, with the average ham nearing sixty and having been licensed for around 45 years, we're probably talking about a 45-year ingrained habit. That's one hell of a rut!

No pain, no gain, as they say, so you're going to have to put some work into this. Now don't panic—I'm not going to ask you to actually think while you're sitting there at the mike—nothing that difficult. You're going to be able to do most of the work while you're listening.

#### Getting Down to Basics

Let's start with some basics—things you know darned well you should have at hand, but have been too lazy to provide. I'm talking as basic as pencils and paper. Hey, I've visited hundreds of ham shacks—gotten on the air from them—so I know darned well you haven't got any decent paper or an actual working pencil around. Get several good pencils and keep them with leads in them. I know this goes against the grain, but buy them if your employer doesn't provide a "free" supply. Make sure they have erasers that work, too. Why you will spend thousands of dollars on your rig, antenna and tower and then chintz at something like pencils to help make all this go I don't know. But I do know this, if I happen to be in your town and I stop off at your house and ask to see your shack, I'm going to find a crummy old chewed-up pencil stub with a hard eraser that makes a mess if I get the wrong letter in a call the first time—one with a nub of a point which I have to turn just the right way to make a mark. Get some cheap mechanical pencils.

Paper. Hey, don't shove an ARRL log book at me for paper. We're going to be taking some notes during contacts from now on and they're not going to fit on one lousy line of your log book. That miserable log book is one of the worst blights in the hobby—it encourages us to make rotten QSOs. Just look at the pitiful space it leaves for comments! No, put the book in the closet or get rid of it. From now on you're going to take notes when you make a contact.

How many times have you made a contact with someone and gotten the impression that he must have at least two other people in the shack who talk with him all through your transmissions? All he does is go through his regular routine blah, with never the slightest pickup on anything you've said. From now on the chaps you talk with aren't going to get away with that baloney any more. If they're going to get on the air they're going to give good contact.

Paper—let's work with a pad of 8-1/2" x 11" paper—lined is probably better. I've seen what happens when you don't have lines to keep you on the straight and narrow. I can see panic beginning to rise—yes, you're going to use a whole sheet of paper for each contact! No more two-inch space in a log book. Not even a 3" x 5" card. No, by George, we're going first

*Continued on page 18*

**QSL OF THE MONTH**

To enter your QSL, mail it in an envelope to *73*, WGE Center, 70 Rte. 202 N., Peterborough NH 03458, Attn: QSL of the Month. Winners receive a one-year subscription (or extension) to *73*. Entries not in envelopes cannot be accepted.

## QRM

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KENWOOD

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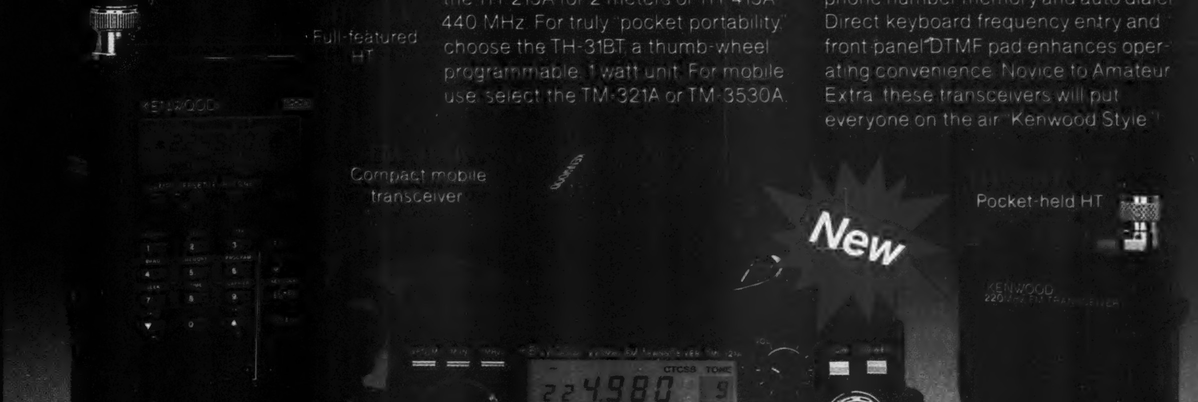
New 220 MHz

# 220: FM for All!

Kenwood brings you a wide range of 220 MHz gear designed for every need. Choose from two types of mobile and two types of HT. The TH-315A is a full-featured HT covering 220–225 MHz. Ten memory channels and 2.5 watts of power. (5 W with PB-1 or 12 V DC.) Uses the same accessories as the TH-215A for 2 meters or TH-415A 440 MHz. For truly "pocket portability," choose the TH-31BT, a thumb-wheel programmable, 1 watt unit. For mobile use, select the TM-321A or TM-3530A. The TM-321A is the 25 W 220 MHz, 14-channel version of the super popular, super compact TM-221A. The 25-watt TM-3530A has 23 channels, a 15 telephone number memory and auto dialer. Direct keyboard frequency entry and front panel DTMF pad enhances operating convenience. Novice to Amateur Extra, these transceivers will put everyone on the air "Kenwood Style"!



**TM-3530A**
**Full-featured mobile transceiver**

KENWOOD

**KENWOOD U.S.A. CORPORATION**
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

***A complete line of accessories is available for all models.***
*Complete service manuals are available for all Kenwood transceivers and most accessories.*
*Specifications and prices are subject to change without notice or obligation.*

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**NEW! 45/35 Watt Dual Bander**

# First Again!

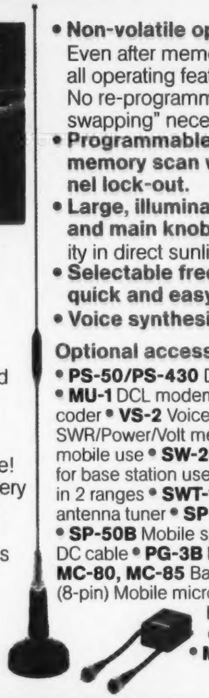
## TW-4100A

### 2 m/70 cm FM Dual Bander

**A Kenwood original just got better! Kenwood was the first to develop a 2 m/70 cm mobile radio in a single, compact package. Since then, other companies have imitated the concept, but still have not done it the "Kenwood way." The all-new TW-4100A is more compact, more powerful , and packed with more features than ever before! With many new features and accessories, and backed by Kenwood's experience, the all-new Kenwood Dual Bander is light years ahead of the rest!**

- **Selectable full duplex cross band ("telephone style") operation.** Remote base or cross band repeater function possible (a control operator is needed for remote or repeater operation*).
- **45 watts on 2 m. 35 watts on 70 cm.** 5 watts (adjustable) low.
- **Frequency coverage: 142-149 MHz (allows operation on certain MARS and CAP frequencies) and 440-449.995 MHz.**

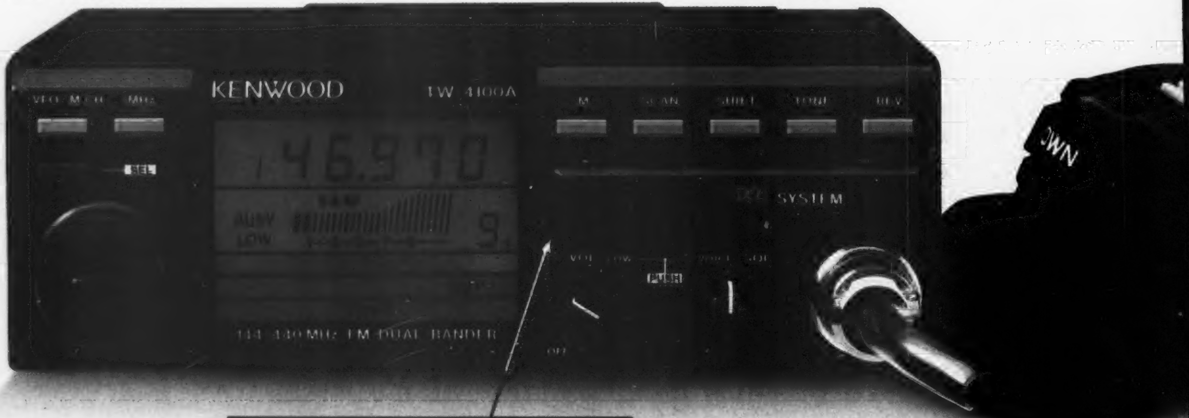
- **New compact size!** Only 5.9" W x 1.97" H x 7.87" D and weighs less than 4 pounds!
- **Proven high performance Kenwood GaAs FET front end receiver.**
- **Easy to operate!** Only 3 knobs and 8 keys on the front panel.
- **Separate antenna ports for VHF and UHF.** Minimizes loss and increases reliability and performance!
- **10 memory channels.** Lithium battery backs up memory. Store frequency, offset, subtone. Two channels store the transmit and receive frequencies independently **for odd split or cross band operation.**
- **Front panel-selectable CTCSS tone (when optional TU-7 is installed.)**

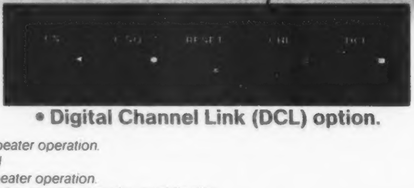


- **Non-volatile operating system.** Even after memory back up cell dies, all operating features remain intact! No re-programming or "board-swapping" necessary!
- **Programmable band scan and memory scan with memory channel lock-out.**
- **Large, illuminated LCD display and main knob.** For excellent visibility in direct sunlight or darkness.
- **Selectable frequency step for quick and easy QSY.**
- **Voice synthesizer VS-2 option.**

**Optional accessories:**

• **PS-50/PS-430** DC power supplies • **MU-1** DCL modem unit • **TU-7** CTCSS encoder • **VS-2** Voice synthesizer • **SW-100B** SWR/Power/Volt meter 140-450 MHz for mobile use • **SW-200B** SWR/Power meter for base station use 140-450 MHz. 0-200 W in 2 ranges • **SWT-1/SWT-2** 2 m and 70 cm antenna tuner • **SP-40** Compact speaker • **SP-50B** Mobile speaker • **PG-2N** Extra DC cable • **PG-3B** DC noise filter • **MC-60A, MC-80, MC-85** Base station mics. • **MC-55** (8-pin) Mobile microphone • **MA-4000** Dual band mobile antenna with duplexer (shown)** • **MB-11** Extra mobile mount





• **Digital Channel Link (DCL) option.**

KENWOOD

**KENWOOD U.S.A. CORPORATION**
2201 E. Dominguez St., Long Beach, CA 90810
P.O. Box 22745, Long Beach, CA 90801-5745

**Please check FCC regulations on repeater operation.*
***Mag mount is not Kenwood supplied*
*Minor modification necessary for repeater operation.*
*Specifications and prices subject to change without notice or obligation.*
*Complete service manuals are available for all Kenwood transceivers and most accessories.*

# QRX . . .

EDITED BY BRYAN HASTINGS KA1HY

## ABC Error

**Investigators from the FCC and the FBI** are trying to track down a wayward radio operator who has been jamming an air traffic control frequency at New York's busy La Guardia Airport. According to several reports, the radio operator gave false landing instructions to incoming jets. A report on the Monday, August 17th, edition of ABC's "World News Tonight" identified the radio intruder as a ham radio operator, but a spokesperson for the news bureau later admitted that ABC had no proof that a ham was involved. She claims that the story was revised in a later feed to delete the ham reference, and could not explain how the original version got on the air.

## Hairy Time

**Hams were swift to respond** to a call for emergency communications after a record 9-inch rainfall marooned Chicago's O'Hare Airport, and flooded thousands of businesses in Cook and DuPage counties on Friday, August 14th. The Northwest ARES spent the entire weekend providing communications to the outside world for the town of Roselle after the basement of the engineering complex of the local Illinois Bell switching center filled with 11 feet of water. This knocked out the system's power plant and telephone service to over 50,000 Roselle and Schaumburg customers. Humana Hospital in Hoffman Estates lost a portion of its telephone system during the storm; The Wayfar repeater made its autopatch available to the hospital. It was used for both internal and external communications.

Salt Creek in East DuPage county overflowed its banks causing the activation of the DuPage ARES, operating under the direction of the Du Page Emergency Services Disaster Administration. They used the facilities of the WCRA Repeater for the entire weekend for emergency-related incidents. The Elk Grove ARC, which is affiliated with the local Civil Defense organization, assisted the fire and police departments in linking the Elk Grove Village Hall, whose basement was completely flooded, to the rest of the community via the KB9L Repeater.

Compliments to the many Chicago area hams who pitched in and helped provide emergency communications.

## O Canada

**The Canadian DOC announced** that effective July 29th, Canadian amateurs may operate on the 17m (18.068–18.168 MHz) and 12m (24.890–24.990 MHz) bands. CW, voice, and FSK, are permitted across the full 100 kHz of each band. All emissions must have a maximum bandwidth of 6 kHz.

Holders of Amateur Operators Certificates may use F1 or A1 emissions only on the new bands.

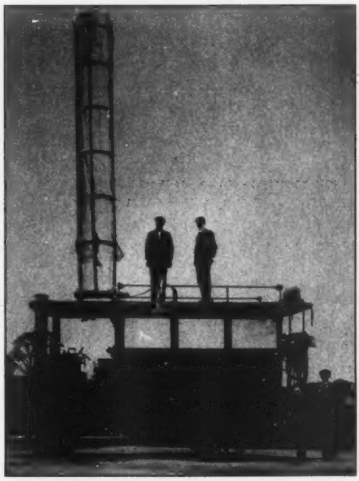
## $12,000 for Ham Ed

**New York City children may soon learn ham in the classroom.** An outstanding group of NYC ham educators—Joe Fairclough WB2JKJ at Junior High School #22 in Manhattan; 1987 Ham of the Year Carole Perry WB2MGP, of the Rocco Laurie School on Staten Island; Ron Lulov KD2LA, who has a program which ties amateur radio in with the Junior Astronauts; Martin Smith KA2NRR, Assistant Director for guidance services in the Office of Student Progress in NYC; and others—a year ago formed a group called The Council for the Advancement of Amateur Radio in the New York City Schools. This group expanded rapidly, and the need grew to standardize the teaching of ham radio in schools. They recently met with the Division of Curriculum and Instruction and the Media Telecommunications Unit and obtained a commitment for $12,000 to write a curriculum on amateur radio to be taught in NYC schools.

According to KA2NRR, "the curricular approach will reach all grades. A curriculum will help insure the continuation of a ham program in a school even after its founder is gone. This way, even a non-ham teacher can be showm how to teach it.

"Once we get the curriculum written, it will be piloted in six schools; two Elementary, two Junior High, and two High Schools."

Smith clearly sees the importance of exposing young people to ham radio. He says: ". . . since I am in guidance, one of the things that concerns me is the career implications for the future . . . if kids are 'turned on' to amateur radio early enough, many will go into engineering, computer, or science fields where we badly need people. I think that the ham radio approach is a great way to move in that direction."



*The smokestack-shaped structure on the car roof is the first mobile antenna, invented by Guglielmo Marconi in 1897. It was soon replaced by the more modern "clothesline" antenna (so named because it looked like six lengths of clothesline strung between poles at the front and back of the car). The familiar whip antenna came on the scene only in 1937.*

## Oops!

**Readers have called to our attention** several omissions in the September Antenna issue. The first is in the Letters department in the letter titled "Oversight"; the article "Death on the Rails" is in the April '87 issue of *Firehouse*. In the article "HF Half-Sloper", the 160-m coil takes 107 turns of #16 enameled wire, and the 80-m coil takes 60 turns of #16 enameled wire. *73* apologizes for these oversights.

## Bagged Mag

**Tired of carefully peeling off the mailing label** to read the Table of Contents? Sick of having your magazine subjected to the vagaries of the weather and Postal Service? Starting with the December issue, *73* subscribers will receive their magazine in protective poly-bags.

## Circuits!

***73 Magazine* is reinstating its Circuits column** in the December issue, after a three-year hiatus. Share your circuit with the ham community and earn a year's subscription to *73* (subscribers will have their subscription extended by a year).

## Finis

**Keep your news items rolling in.** Items for this month's column are courtesy of *Westlink*, *London Times*, *Chatter Bug*, *Designfax*, and the *ARRL Newsletter*.

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# LETTERS

## BRASS BANGER BROTHERHOOD

So what do I want out of amateur radio? I want 2 meter and 440. Why do I want the local stuff? Okay, I'm too cheap to shell out a kilobuck up front and a hectobuck a month for a mobile phone just so I can call the highway patrol when I see someone in trouble on the road.

If it weren't for the close-knit amateur community where I work, I wouldn't even be going for a ticket. It's because of the encouragement of four folks in the amateur club who are taking time out of their busy schedules to teach a class after hours that I'm even trying. One of the big lures is the open 440 repeater on top of the building.

So it's up to all of us who have the knowledge to turn others onto the brotherhood that exists between us brass bangers. If you just spend your time DXing on the advanced bands, you're gonna run out of contacts unless you help novices work their way up. I don't have the time to get involved in any community emergency work, but you can bet your carrier I'm gonna spread the word of how amateur radio can make this a better world for all of us.

It's the people like you (Wayne) who'll keep the rest of us interested in the hobby. In fact, it was you who got me building an IMSAI in 1975, which this letter was written on.

**Ronald M. LaPedis**
**Daly City CA**

## KUDOS

I have enjoyed the improvement in the magazine since you (Wayne) have returned and look forward to more great articles.

**John G. Boles KA6LWC**
**San Jose CA**

## EXTRA

Yes, I'm an Extra with one of those funny calls as W2NSD calls them. Perhaps Extras are crazy from the code. Perhaps the old saying, "You don't have to be crazy to work here, but it sure helps," can be applied to contesting, high-speed CW, chasing DX, or maybe I should say any form of amateur radio operating. Myself, I don't care if I'm labeled crazy. I thoroughly enjoy operating and also teaching amateur radio classes. Amateur radio is my hobby that doesn't provide any barriers that I've come across that I can't overcome. Hell, I had to try to master 26 WPM CW to make me crazy and obtain that funny call, and I did it! I'm proud of my 2 x 1 call and feel honored to be labeled crazy.

**Jim Buikema NR9G**
**Morrison IL**

## HONEYDITION?

Wayne, if you truly want to aid the ham community I have some challenges for you: Both *73* and QST do a poor job in an area that represents half the world population and which controls some 70% of the money. Yes, I'm talking about the YL/XYL world. QST is a little better with their YL column, but in fact we are still guilty of male chauvinism.

YL/XYLs care more about appearance than do OMs. I'm referring to rigs, operating desk, and outdoor antennas. Consider the possibility of ten dB trees, his 'n' her rigs, packet palm trees. How about a *73* 2-meter marriage offer—get married via repeater and win a paid DX honeydition to Antigua.

The potential to double the US ham population is more real than the controversy, and divisiveness of the code/no-code issue.

**Bernie Coler KC7CP**
**Corvallis OR**

## NTS NOTES

You finally got me with your invitation to comment on the ARRL National Traffic System in your *73* piece of April. Of course, the traffic could be better handled by packet, and some of it probably will be. ARRL could force this to some extent by only making Brass Pounders League certificates available to traffic handlers who use packet, and only listing packet traffic totals at the end of section news columns in QST each month. I personally wish this would happen so that the ARRL would no longer have any excuse for not giving phone contester and DXers (like myself) the use of SSB between 7075 and 7100 kHz, so we wouldn't have to work crossband on 40 meter phone to work the DX anymore. You recall that the ARRL board was about ready to propose this to the FCC at one point when the CW traffic hounds in the so-called Transcontinental Corps protested that these were their frequencies. So much mail flowed in to the Directors that they quickly backed away form their proposal.

The plain and sad truth is that you are one of the few old timers around who is willing to consider new ways of doing things.

Nets also provide satisfaction to the busybodies and would-be dictators in our ranks. Woe onto the check-in who fails to get his preamble exactly right!

The Mexico earthquake shocked a number of traffic hounds by proving that the NTS was practically useless in such a situation. Far from depending on organized nets, the success of the operation depended on the ad hoc common sense of many amateurs who adapted their operation to the objective requirements of the moment, which did not include the use of organized nets or the ability to use the standard preamble. The fact is, the Mexican earthquake operation was a model of efficiency, and it broke all of the NTS rules at the same time. This was a pretty hard reality for a lot of the regular traffic handlers to swallow! Many of the most successful participants were DXers and contesters equipped for 20 meters where the operation took place, and they were more accustomed to dragging signals through QRM. Since almost all operation was on SSB, it did little good to be a hotshot CW brasspounder, either. And, finally, nobody had time to worry about a proper preamble. A number was good enough.

I should pause to give credit to nets like the Intercontinental Traffic Net here. At least their daily operations are much closer to the type of operation needed during a massive earthquake. They do not require that check-ins stick to formal traffic forms. But their regular check-ins are not usually the ones getting ARRL Brasspounder League awards, either. Finally, it turned out to be very useful to speak English. And

*Continued on page 45*

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# The DM-4061 Dip Meter

Electronic Equipment Bank
516 Mill St. NE
Vienna VA 22180
Price Class: $90

## *A simple device offers a multitude of data.*

*by Bill Clarke WA4BLC*

> ***"Education consists mainly in what we have unlearned"***
>
> Mark Twain

Long ago, when hams built most of their equipment, almost every one had a small, multipurpose tool. It was used for testing and aligning tuned circuits, tuning receivers, measuring frequency outputs, checking for harmonics, plus designing and testing antennas. The device was not large. It could even be held in the palm of the hand. What was it? The grid dip oscillator—generally referred to as a dipper.

Now that we live in the world of transistors, there are no grids to dip. So, the modern version of the grid dip oscillator is the dip oscillator. The principles of operation are the same. Recently, I obtained an EEB Model DM-4061 Dip Meter (oscillator), and was so impressed that I felt I should spread the word. Actually, I had been looking for a used dipper at the local hamfests, but to no avail. Then I was out at EEB (Electronic Equipment Bank of Vienna, Virginia) and saw a brand-new one for an affordable price of $90.

I can't say the packaging is impressive, nor was the plain wrapper, but when I opened the unit to install the nine-volt battery, I was impressed. The mechanical design and layout of this piece of equipment will allow it to operate in a stable manner and prevent damage if it receives a little rough treatment. The single weak point is the plug-in coils, which are fragile and exposed, thus easily broken. This tends to be the same problem for all grid-dip oscillators and dip oscillators.

After I put the cover back on the dipper, I turned it on and listened for the oscillator signal on my Kenwood TS-430. Sure enough, there it was, and right where the color-coded dial said it would be. The frequency tuning dial on the dipper is color-coded to correspond with the color coding of the plug-in coils.

Like all new toys, I went right to work using the dipper. Since it put out such a nice signal, I decided to put it to work and align my Drake TR-3. I opened my service manual for the Drake to check what frequency I should set the dipper for, and proceeded to align the receiver section as instructed. For HF receivers, the dipper puts out a stable signal, ideal for the purpose of receiver alignment.

### Tuned Circuits

Next I did some sniffing around in my linear amplifier project. Sniffing? That's what it's called when you probe around the inside of electronic equipment with a test device.

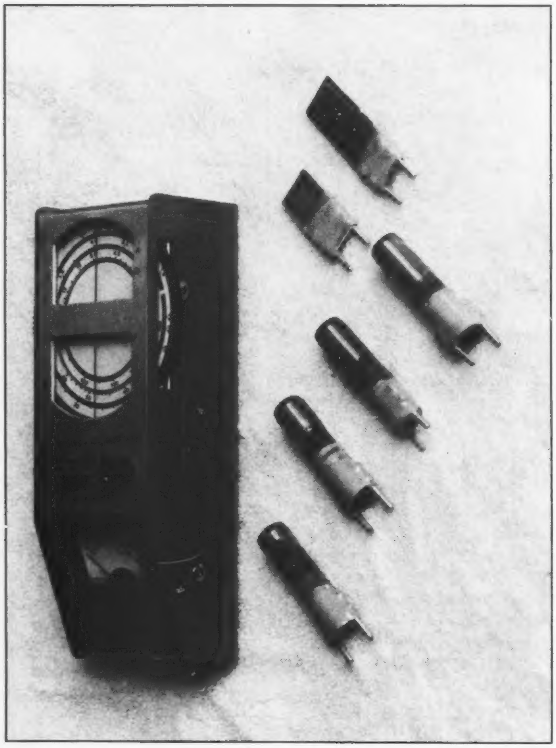

*Photo A. Dip Meter with six plug-in coils.*

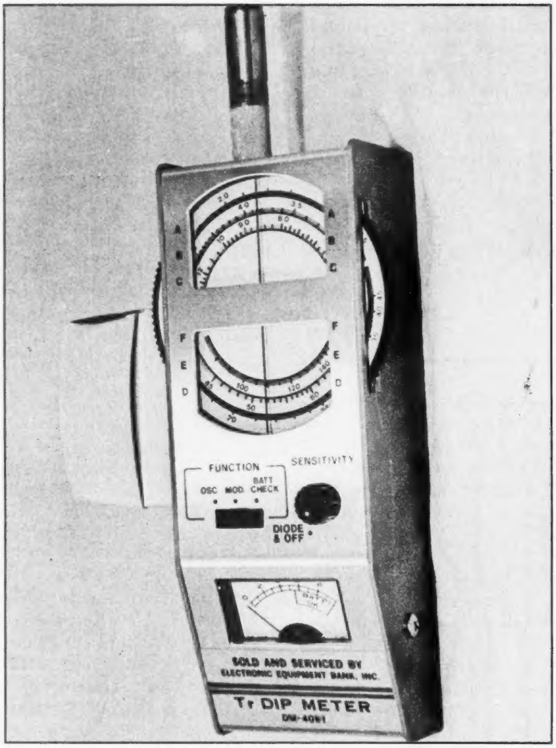

*Photo B. The DM-4061 Dip Meter.*

**SPECIFICATIONS**

Frequency Range (in six ranges):
A - 1.5 to 4.0 MHz
B - 3.3 to 8.0 MHz
C - 6.8 to 18 MHz
D - 18 to 47 MHz
E - 45 to 110 MHz
F - 100 to 250 MHz
Modulation: 2 kHz
Xtal Oscillator: 1–15 MHz (must be in FT-243 holder)
Power Supply: 9-volt internal battery
Consumption: 2 mA maximum
Solid State Devices: 2 transistors and 1 diode
Dimensions: 6-7/8" x 2-9/16" x 2.0"
Weight: 1.1 lbs.

**CONTROLS**

Main Tuning: frequency dial with six color coded bands corresponding to the coil in use.
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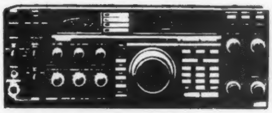

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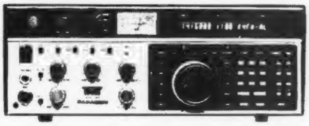

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Seems I was having a little problem in getting the tuned input circuits set up.

I began by plugging in the B coil (3.3 to 8.0 MHz) and advancing the sensitivity control until .8 registered on the dipper's meter. Then I moved the coil close to the tuned input circuit and slowly rotated the frequency dial until I saw the meter dip. I checked the frequency on the orange scale of the dial—it read 2.9 MHz. Using a non-conductive tuning wand, I proceeded to make adjustments to the coil in the tuned ciruit. After moving the coil slug, I again checked for dip. The first time I found the dip at 3.5 MHz, the second I got on the money—3.8 MHz. Quite handy indeed. The dipper saved me a lot of time and kept me from tuning the inputs with the amp working.

I had never completed hooking up all the taps on the final plate coil of my amplifier, so I used the dipper to determine proper tapping of the plate coil.

The dipper's meter showed .8, and I placed the plug-in coil near the plate coil and turned the frequency dial until I got an indication (a dip). I read the dial frequency, and then moved the tap as necessary to change the resonant frequency. Tap for more coil to lower the frequency of resonance, less coil to raise it. Don't forget that the capacitor settings will vary the resonant frequency considerably.

After checking each band's input, retuning all of them, and making the necessary coil taps on the plate coil, I warmed up the amp. It was time to check operation.

Once I verified operation of the amp (in other words it amplified), I checked for parasitics in the final section. I turned the dipper off and set the function switch to osc, then keyed the transmitter and amplifier. Using the plug-in coil as a sniffer, I placed it near the output of the final stage. Then, tuning the frequency dial, I looked for indications of output. Naturally, there was an indication at the carrier frequency, and fortunately none of any significance at any other frequency.

### Testing

Now that the amp was ready, I thought it would be good to check out the antenna. I used a set of dipoles on a single feedline for 160, 75, and 40 meters. I constructed a small loop of wire, about an inch in diameter, and attached it to the shack end of the coax line. Then I turned the dipper on and set the function to osc. I placed the sniffer coil inside the loop and turned the frequency dial. I found peaks at 1.9 MHz, 3.9 MHz, and 7.2 MHz—just where they were supposed to be.

There are many other uses for the dipper. Among these are: testing antenna traps, adjusting antenna tuners, making feedline adjustments, setting mobile HF antennas, testing tuned circuits in receivers and transmitters, or checking just about anything that can be considered tuned. You can even test crystals.

Although the dipper performed quite well at HF frequencies, it fell off in the VHF range. However, this should not be discouraging. Generally, the only test equipment that works well in the VHF region costs lots of bucks and is quite sophisticated. For general HF ham usage I think the EEB Dip Meter is well worth having. ■

*Jon Enoch VE7JON*
*S-11, C-69 RR#1*
*Kelowna, B.C.*
*Canada V1Y 7P9*

# The Tesla High Frequency Transformer

*A unique demonstration of electrical resonance for the experienced hobbyist.*

The spark-excited Tesla high-frequency transformer provides a display that leaves most first-time observers wide-eyed and speechless. Although it won't find too much use in the hamshack, it provides such an awesome demonstration of electrical resonance that one would make an ideal ham club project. The working of a transformer offers a unique visual aid for teaching a new ham candidate resonant circuit theory as he observes a crackling eighteen-inch spark discharge itself into the air.

Just to refresh your memory, a Tesla is a unit of magnetic flux. My first coil was built around a commercially available neon sign transformer. These units are usually rated around 30 to 120 mA and come in various voltages. A 7500 to 15000 volt unit is perfect for a 30-inch coil and will produce a corona anywhere from 12 to 20 inches in length. These transformers can usually be found at scrap metal yards or pulled from discarded furnaces. Mine was a surplus unit given to me by a local ham. Referring to Figure 1, the Tesla's secondary may be considered a transmission line of ¼ wavelength. As the capacitors (A) are charged by the neon transformer's secondary (B) their voltage breaks down the spark gap (C) causing the capacitors to discharge through the Tesla's primary in an oscillatory fashion. The Tesla secondary is made resonant with the primary so that the excited primary causes the secondary to oscillate in resonance. This in turn generates a high voltage with sufficient magnitude to cause a corona spark discharge at the secondary's top electrode (D).

## Construction

After you have acquired the transformer, begin work on the Tesla secondary. Locate a 30-inch length of PVC (or similar material) sewer pipe about 6 inches in diameter. This material must have good dielectric properties. Beware of materials that could melt or carbonize due to arcing. The pipe should then be taken to a shop or fellow amateur who is equipped with a lathe since the tube must now be trued and threaded its full length with 20 shallow threads per inch. These grooves will serve to hold the secondary winding which is wound with one continuous length of #26 or #28 cotton or enameled wire. Ideally, this winding would be applied while the tube is still on the lathe, while the operator feeds the wire from a spool onto the grooves. In my case, I rigged up a small motor with a reduction gear to rotate the tube while I applied the winding. This was necessary since my tube was turned on a lathe out of town.

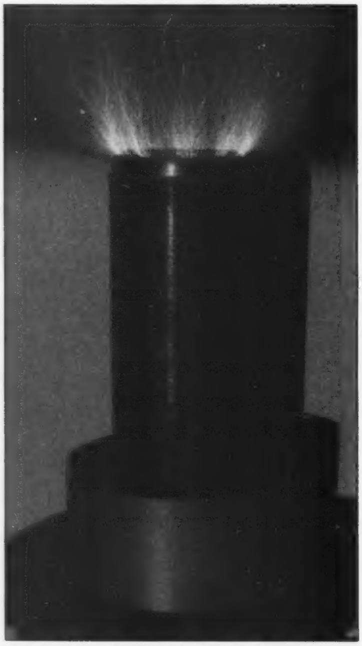

*Photo A. Completed Tesla primary and secondary coils.*

After the winding is completed the entire coil is given 3 or 4 coats of shellac and allowed to dry between coats. This prevents arcing between adjacent windings. A 6-inch gong from an electric bell or, as in my case, an aluminum ashtray, make a good top electrode. Drill a small hole in one end of the secondary and pass the last few inches of the winding through the hole to the inside of the tube, where it is soldered to the underside of the top electrode. The electrode is then glued with silicone seal to the top of the secondary's form. The Tesla secondary is now complete.

The Tesla primary consists of approximately 8 turns of #6 gauge copper ground wire which is commonly available at most hardware stores. About 40 feet will be needed for our purposes. This wire is wound onto a wooden form, the construction of which I will now describe.

Begin construction by cutting two identical wooden rings from a ¼ sheet of ¾ inch plywood. The outside diameter of these rings measures 18 inches, while the inside diameter measures 11 inches—thus the width of any given part of the ring is 3½ inches. I cut my rings with a common hand sabre saw. When both rings are completed, place one atop the other and temporarily screw them together in alignment.

Next, mark and drill twelve ½ inch holes through both rings at 1¾ inch centers from the outer ring edge. These holes are equally spaced around the rings (see Figure 2). Now cut twelve 1-foot lengths of ½ inch diameter wooden dowel. When this job is finished, insert the 12 lengths into the holes previously drilled into one of the rings. You will now have one ring forming the base of a cage with 12 rods sticking up into the air. Now place the second ring on top of the form and gently tap the top ring into place with a mallet. White wood glue should be used on all dowel ends. You should now have a kind of round wooden cage on which you will wind the primary coil. When the woodworking is complete, give the entire assembly 2 or 3 coats of shellac, allow-

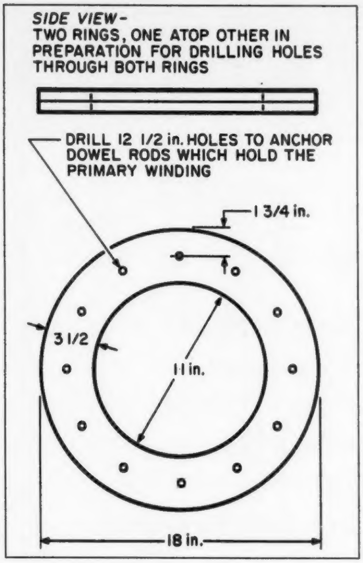
SIDE VIEW-
TWO RINGS, ONE ATOP OTHER IN PREPARATION FOR DRILLING HOLES THROUGH BOTH RINGS
DRILL 12 1/2 in. HOLES TO ANCHOR DOWEL RODS WHICH HOLD THE PRIMARY WINDING
1 3/4 in.
3 1/2
11 in.
18 in.

*Fig. 1. Circuitry for the Tesla high-frequency tranformer.*

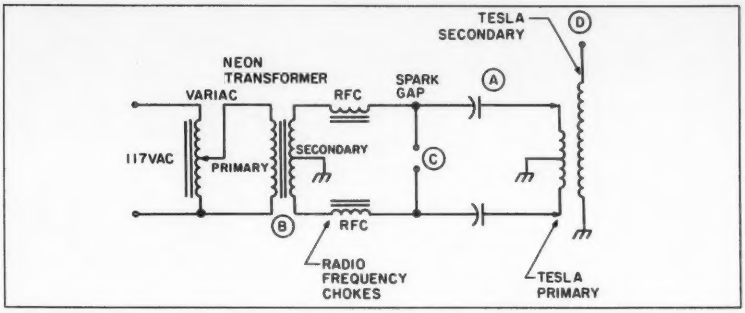

*Fig. 2. Construction diagram for the Tesla high-frequency transformer.*

ing each coat to dry before applying the next. Now take the length of #6 copper wire and wind onto the wooden form about 8 or 9 turns spaced about 1 inch between windings.

If the windings are applied tightly, the coil will stay put without any coaxing; however, if loosely applied, you will probably need to tape the windings into place with electrical tape. I don't really recommend the latter procedure. I anchored each end of the primary with plastic tie-wraps. Alligator clips will be used later to apply power to the primary because they are easy to adjust when tuning the tesla tranformer. With the completion of the primary, you are now 90% home!

### Circuit Details

Depending on the rating of the transformer you use to furnish the power, you will need to do a little figuring in order to find the required capacity value. First, divide the transformer's secondary voltage by the power rating. For example, my transformer secondary was rated at 7500 volts @ 30 mA, thus E/I implies an impedance of 250,000 Ohms. You will need to plug this value into the following formula to find the capacitor's value:

$$C = \frac{1}{2\,\mathrm{pi} \times F \times R}$$

Where C equals capacity in farads
F equals Frequency (60 Hz)
R equals impedance (from the former calculation)

My circuit required a capacity of .01 uF. Because neon transformers have a center tap on the secondary grounded to the case, a symmetrical primary circuit balanced to ground is required. Consequently, two .02 uF capacitors connected in series must be used to get the .01 uF value.

Capacitors must be of the high voltage type—either mica or oil-filled surplus types may be used. The operating voltage on my oil-filled types were rated at 8000 volts. You can make capacitors from glass plates covered on both sides with tinfoil. However, in some applications the heat generated may crack the glass and blow the capacitors along with the transformer. Alternatively, double sided copper clad circuit board with the outer edges etched away to prevent arcing might be another possibility. Although I have not personally gone this route, I would be more than happy to hear from anyone who has tried this method.

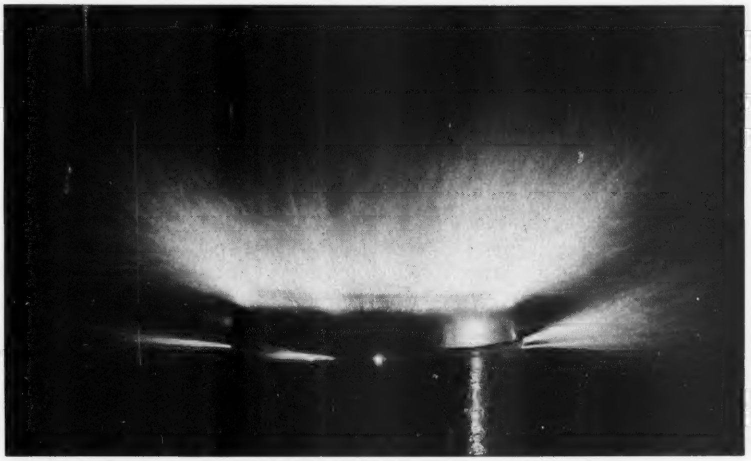

*Photo B. High voltage discharge from secondary's top electrode.*

To keep damaging high frequency currents out of the neon transformer's secondary, where they could break down the insulation on the windings, pi wound radio frequency chokes must be used. These can also be made by winding small, empty wire spools slipped onto a spare piece of wooden dowel. Refer to the circuit diagram for placement of these chokes. A spark gap can be made from 4 parallel copper plates about 2 inches in diameter. I used two adjustable capacitors from an old transmitter. The capacitors consisted of two round metal disks which could be adjusted for spacing. I used two of these capacitors in series to form my spark gap. It functions very well. A method of adjusting the gap size is required to trim the frequency during tuning up of the tesla coil.

### Hooking It All Up

After you have completed both primary and secondary and acquired all other parts, start hooking the Tesla coil together. Find a spot where the coil will not be disturbed—my Tesla coil is permanently installed in my basement, away from the probing hands of my two year old daughter. A few words of warning are in order here: The voltage you are about to work with here is very dangerous. Be extremely careful. A neon sign transformer with a secondary rated at 15,000 volts at 120 mA could easily provide a fatal shock.

Place the primary on some non-conducting material. My coil sits on top of a table covered with formica. Next, place the secondary in the center of the primary. The bottom end of the secondary and the midpoint of the primary are connected together. This point is also connected to the case of the neon sign transformer. Connect the two radio frequency chokes to each side of the neon transformer's secondary, the other end of the chokes connect to the spark gap. The capacitors are then connected in series with the Tesla's primary and spark gap. Check the diagram for clarity on this point.

A variac must be used to slowly bring up the power on the neon transformer's primary. Otherwise, switching the unit on to the line at

*Continued on page 31*

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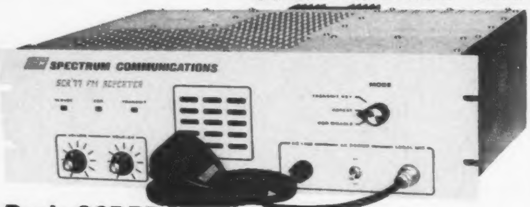

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# Signal Strength Reporting Revisited

### *An update on signal strength reporting*

Has there ever been a measurement subject to greater abuse and ridicule than the simple process of giving our fellow hams on-the-air signal strength reports? "For practical purposes, the RST system, as practiced today, is a farce—yet it's the most common exchange between stations. Consequently, meaningless guesstimates echo endlessly through the ether," says a recent article.

A review of the history of this method can point to a solution, namely, an improved method of signal strength reporting which is both simple and qualitatively reproducible.

## A Brief History

In the beginning, ham receivers didn't have S-meters. Also, they didn't have automatic gain controls so the setting of the volume control was used to provide a crude indication of signal strength. In fact the first receiver that I used (National SW-3) had nine numbers on the volume control knob for this purpose! During that era the reporting system used for radiotelephone was the QSA-R system. QSA-5, R-9 meant 100% readable and maximum signal strength.

The next improvement in the reporting of signal strength followed upon the heels of the introduction of automatic volume control (AVC, AGC) circuits. As soon as designers developed circuitry which provided an AVC voltage more or less proportional to signal strength, it was obvious that ham receivers would have a meter providing a measure of this voltage. The early signal strength meters had nine equal scale divisions so that the very strongest signals read: 9. The first new receiver that I ever bought, a Breting 14, has that type of S-meter. This was a logical system—and all that remained was for the engineers to develop a linear, decibel meter circuit.

Alas! At that point the picture became cloudy. Apparently someone (was it a marketing man?) pointed out that hams would appreciate reports of super signal strength. All that was required to achieve this (and thus ruin a rational plan) was to put the S-9 mark at the middle of the meter scale. Then all signals stronger than this would be measured in dB above S-9! In this context, the term dB has lost all logical meaning—it does not mean decibels, or anything else concrete.

If you doubt this, just turn on a linear amplifier with 10 decibels gain sometime and ask your contact to tell you what his S-meter increment was. He'll probably read 20 dB, at least! Actually, there is a standard using six-decibel S-units and defining S-9 as 50 microvolts R.M.S. across a resistance of 50 Ohms. However, this is difficult for the average ham to measure, so, over the years there has been little conformance to this or to any other standard of signal strength level. When testing the sensitivity of ten popular rigs, a range of meter readings was found at S-9 varying from 20 microvolts to 265 microvolts—a disparity of more than 20 decibels!

## An Analysis

Figure 1 shows typical levels of signal strength encountered in ham radio, referred to as the standard DBM or milliwatt-decibel scale. Reading the figure from the bottom upward—first, we see (or hear) the inherent noise generated in the input circuitry of the receiver. Of course, this is dependant upon several parameters, including the bandwidth, but for our purposes, we can assume these to be fairly constant among receivers of modern design. Typically, this is the noise that we measure if we place a fifty-Ohm resistance across the antenna terminals of the receiver. For practical purposes, a one-femtowatt signal (10-15 watts) would be a barely perceptible signal, whereas, a 100 nanowatt (10-7 watts) level would be extremely strong. We still disregard any readings stronger than this (see Figure 1).

Figure 2 follows directly from Figure 1. Here, we have eliminated some unnecessary

```
          PWR                 VOLTS
 DBM     WATTS       PWR    (50 OHMS)    REMARKS
   0      1e-3       1MW     2.24e-1
 -10      1e-4     100uW     7.07e-2
 -20      1e-5      10uW     2.24e-2
 -30      1e-6       1uW     7.07e-3
 -40      1e-7     100NW     2.24e-3 EXTREMELY STRONG SIGNAL
 -50      1e-8      10NW     7.07e-4
 -60      1e-9       1NW     2.24e-4
 -70     1e-10     100PW     7.07e-5
 -73     5e-11      50PW     50.0e-6 CONVENTIONAL STANDARD "S-9"
 -80     1e-11      10PW     2.24e-5
 -90     1e-12       1PW     7.07e-6
-100     1e-13     100FW     2.24e-6
-110     1e-14      10FW     7.07e-7
-120      1e-15      1FW     2.24e-7 FAINT SIGNAL-- BARELY  READABLE

          0 ///////////////// RECEIVER BACKGROUND NOISE
```

*Fig. 1. Typical levels of signal strength.*

```
 DBM   DBNS NS-UNITS     REMARKS
 -40    90    9      "EXTREMELY STRONG SIGNAL"
 -50    80    8      "STRONG SIGNAL"
 -60    70    7      "MODERATELY STRONG SIGNAL"
 -70    60    6      "GOOD SIGNAL"
(-73    57            CONVENTIONAL STANDARD "S-9")
 -80    50    5      "FAIRLY GOOD SIGNAL"
 -90    40    4      "FAIR SIGNAL"
-100    30    3      "WEAK SIGNAL"
-110    20    2      "VERY WEAK SIGNAL"
-120    10    1      "FAINT SIGNAL, BARELY PERCEPTABLE"

-130     0  ///////RECEIVER BACKGROUND NOISE
```

*Fig. 2. Signal strength in the RST system.*

data and we have also assumed that the faint, barely readable signal is ten decibels above the receiver background noise. In Figure 2 the labels shown under REMARKS are directly quoted from the ARRL handbook's definition of Signal Strength in the RST system. It is interesting to note that under the simple assumptions which we have made, there are just nine levels of signal strength and that these levels are neatly arranged in ten decibel steps (see Figure 2)!

I have chosen to label these "NS-Units" or, nine-steps units, to differentiate from the conventional, largely meaningless, "S-Units" which are in common use. Correspondingly, there is a "dB-NS" column which indicates signal strength in decibels above receiver noise.

### Application

Now, how can we apply all of this history and theory to the typical ham radio environment?

The most rigorously exact way to measure signal strength in NS-units would involve the use of a circuit which reads linearly in decibels. The circuit gain would then be set so that the meter indication would show nine equal scale divisions of ten decibels each. The zero reading would apply when a fifty-Ohm resistance is placed across the antenna terminals to the receiver. The NS-9 reading would correspond to the strongest signals heard.

However, there is a simpler, less exact way to realize the advantages of nine-steps signal strength reporting, which does not require the use of additional circuitry.

> *"In the beginning . . . the setting of the volume control was used to provide a crude indication of signal strength. In fact the first receiver that I used had nine numbers on the volume control for this purpose!"*

The S-meter circuits normally used in transceivers are sufficiently linear in decibels to serve our purpose and some are actually quite good in this respect. We really only have to set the calibration and zero adjustments of the S-meter so that the strongest signals read full scale and so that the meter reads zero when a fifty-Ohm resistor is placed across the antenna terminals!

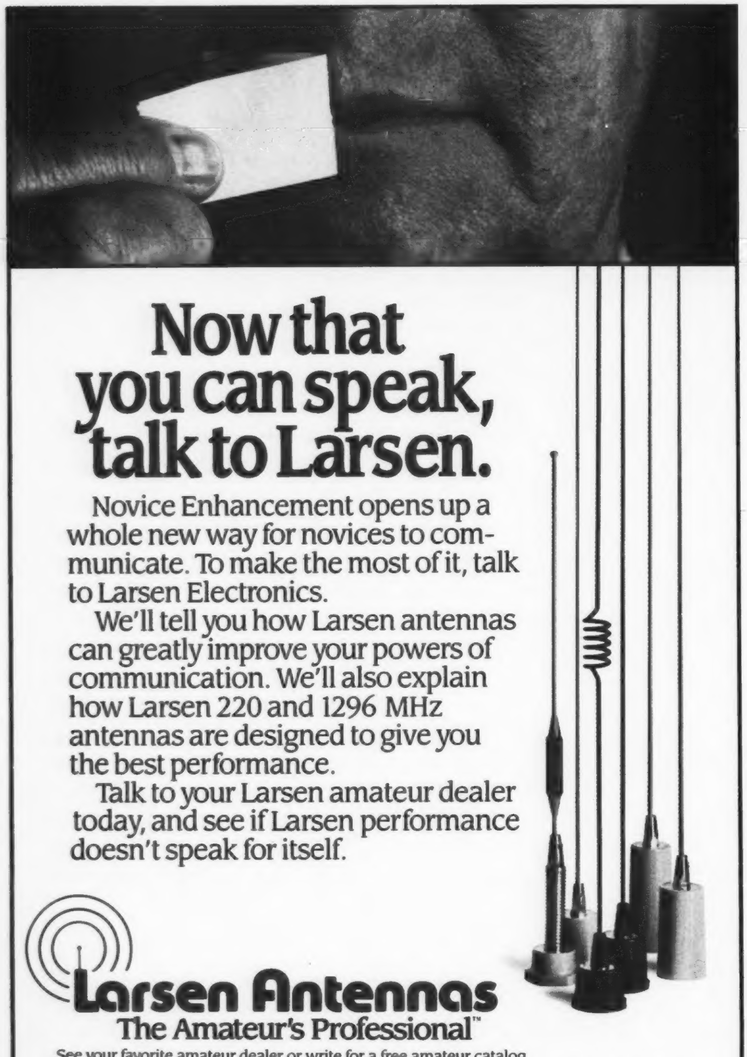
If an R.F. attenuator is available the nine fiducial marks can be placed at ten-decibel intervals on the meter face. (For this purpose, a transparent overlay of Saran-Wrap or other transparent plastic can be used. Those who are a little more venturesome can usually find a meter which can be added externally in series with the regular S-meter, so that nothing else in the transceiver need be disturbed.) If an R.F. attenuator is not available, calibration marks can still be added. In this case, the nine fiducial marks are just spaced equally across the dial face. Here, we are tolerating the nonlinearity inherent in the dB meter readings for the specific rig being used.

### Results

I have used the general method described for several years now, and the benefits, in terms of simplificition and consistency of signal strength reporting have been quite gratifying. It is a real pleasure to give comparative reports on different receivers and not to have the 20 decibel disparity.

**Reference:**

[1] Robert J. Zavrel, Jr., "A Calibrated S-Meter", Ham Radio, January 1986.



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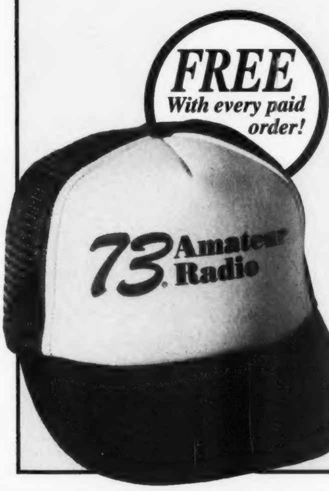
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# NEVER SAY DIE

*Continued from page 4*

class from now on and we're going to use a whole page to keep notes. It won't break you. Oops, there go some yellow pads from work.

**Up With People**

This may be a new concept, but you're making contact with people—real live people. I know you've recognized this on some level of awareness in the past, but the log book approach tends to make us think in terms of working "stations"—where we think of the call letters rather than the person. You tell your wife you worked Germany, not an interesting chap named Lothar Werner in Stuttgart with the call DJ1BZ. You're going to be talking with people from now on, not just places and call letters.

On the page you're going to make notes of anything of possible interest your contact mentions. What's of interest? Ahhh, there's the secret. Who is the most interesting person in the world to you? Yourself—haven't you noticed that's who you talk about all the time? So, if you want to be fascinating to contact, all you have to do is steer the conversation toward getting the other chap to talk about himself. You make notes.

Okay—he'll tell you where he lives. Fine, you don't even have to ask for that. You know, I've mentioned I'm located in Peterborough, New Hampshire, a dozen times in every contact for twenty-five years now and maybe two chaps have ever asked me about Peterborough. Ask me how come I'm living there and you'll get an interesting story. Ask me what's it like around Peterborough and I'll tell you about having one of the largest A&Ps in New England—about the McDowell artist's colony which brings all sorts of famous people to Our Town. I might even mention that Our Town was written about Peterborough—in case you're familiar with the famous play by Thornton Wilder. Peyton Place was written about Gilmanton, New Hampshire. You making notes?

You don't have to bother with notes on the weather—that's just blah blah—like a recitation of my rig model. Of course, if you ask me what I like best about my rig, you might get me going.

The time was when you could ask someone what they did, but now, with almost all hams being retired, it's probably better to ask what they used to do. It doesn't hurt to ask if they have any other hobbies or interests—I've got a few, but I can't remember the last time anyone asked...1968, I think it was.

Oh, you'll run into some hardcore cases—chaps seemingly with no interests whatever. If you ask how many grandkids they have you'll unloose a torrent. I got started late, so I don't have any, but you ask my wife, Sherry, about her grandchildren and you're set for the next half hour. She's got eleven of 'em! Making notes?

> ***"There are thousands of interesting, exciting people out there."***

By the time you get through asking about the town, what he's done and other interests, the band will probably be changing. File the page by call so you can find it the next time you hear him, and carry on from there. One look at the page and the whole contact will come back to mind just as if it was yesterday—even after a couple of years. You'll find the chaps you contact are turning into people instead of just a line in the old log and a QSL card. It's also handy to keep a cross-index of the chaps you've worked on top of the pile of notes, so you don't have to thumb through to see if you've worked someone.

**More Props**

Have a road atlas at hand for stateside contacts and the best world atlas you can find for DX. Then, when you talk with Homer Sawtelle W1KPL in Jaffrey Center, you can ask him about Mt. Monadnock, which is near his town. You might find out that the nearest movies are in Keene or Nashua—and that the Monadnock Inn is a pretty good place to eat, if you're in the neighborhood. If you fly, you might drop in at Silver Ranch airport in Jaffrey.

The more you get 'em talking about themselves, the more interesting you're going to be. The more you talk, the more boring the contact—usually. Of course, if you find you both have an interest in guns, collecting comic books, match book covers or antique marbles...you're flying.

I suppose you're so used to being regimented by the League that you're going to want me to print special log pages for you with spaces for the call, name, town... and so on. Give me a break!

Maybe this new aspect of hamming will get you off the kick of moving from one lousy pileup to another, swapping call letters and a report and moving on. Look, you know as well as I that your signal can be heard anywhere in the world on the DX bands, so why all this macho beating your way through pileups? Are you really so insecure that you have to prove to the world that your rig can cream some other poor ham with lower power or worse propagation? And for what? I don't even know where my 300+ countries of QSLs are—probably thrown away sometime. The real fun of amateur radio is the communications it provides, not certificates or a listing in QST. There are thousands of interesting, exciting people out there—all you have to do is pry them out of their shells.

You know, what seems like an endless number of hams on the bands will start sorting itself out into friends once you make contacts interesting for others. You'll find them looking for you and calling you—and their page coming out of your file and gradually filled as you learn more about them.

If you're into DXing you might ask how things have changed in their country in the last twenty years or so. We've seen change here in America, but it's nothing compared to what's been happening in many other parts of the world. If you're lucky enough to talk with someone from Africa, check out what's happened there! The changes in most of Africa just in my lifetime have been incredible—going from a mysterious dark jungle continent to one where we're reading about the problems of many African countries in the morning papers and watching specials on TV.

When my mother was young she met Osa Johnson while vacationing in Vermont—Osa married Martin Johnson, an explorer, when she was around 15 and went with him to Africa, where they made movies of what they found. The Martin and Osa Johnson movies went over big here. The 1920s and 30s Africa, which had been that way for thousands of years, is now gone—forever: a land of pigmys, women with rings around their necks to stretch them, plates in their ears.

Look for Andy 9M8PV and ask him about the head hunters just one generation ago. Ask about the long-house villages. Ask about the 30-foot croc in the Sarawak River picking off kids swimming in the river and the mystic they brought in from Indonesia to help find it.

**Communication Power**

Amateur radio gives you the power to actually communicate with Sarawak, not just get a signal report and a QSL. You can talk with hams in Kenya who remember the way it was. Not to disturb your political convictions, but you might even ask some South African hams their perspective on what's going on there—I think you'll be surprised to learn their viewpoint and get an inkling as to how much bias we live with here from our liberal press.

You know, we make fun of the Soviets and their practice of twisting everything to present the distorted view they want their people to believe. Unless we open our ham communications system to other parts of the world we have no way of judging how distorted our own view is.

The same goes for other countries, too. I'm writing this in Leningrad, so I'm keenly aware of how little communication there is between America and the Soviets. It's going to take a lot of persistence to get them over their fear of openness—despite the recent advent of glasnost, which means "openness". Can we ever get them to actually talk about themselves over the air?

For a communications hobby it's amazing how little actual communicating we do.

Let's make today the first day of your real ham career. Get a pad, pencil, an atlas and get cracking...see if this doesn't make hamming a lot more fun.

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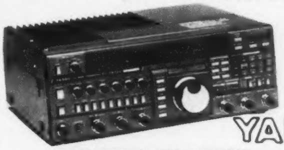

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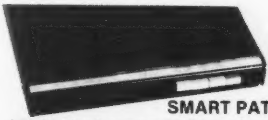

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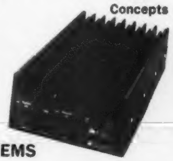

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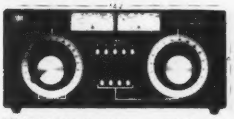

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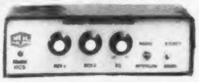

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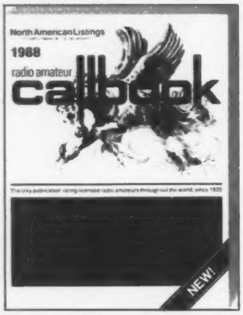
# Holiday BUYER'S GUIDE

## CALLBOOK

Want to QSL those new contacts? Then you need the Callbook!

The 1987 North American and International Callbooks list calls, names and mailing addresses for over 950,000 licensed amateurs in countries around the world. In addition, they include International Postal Information, Worldwide QSL Bureaus, Standard Time Charts, Prefixes of the World, a Census of Amateur Licenses in each country, and much more. The price for the Callbooks vary. The North American listings are $28, and the International Callbook is $30. These are available in December. The Callbook Supplement, which combines both North American and international new listings, is available for $13. The supplement is published in midyear. The publisher offers both the North American and the International Callbooks are $55. The above prices include shipping to USA addresses only. Amateurs in other countries are invited to request a quotation for LifetimeSubscriptions.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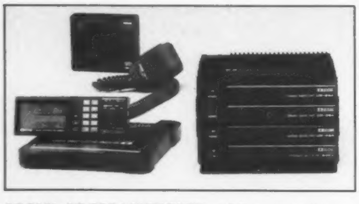
*The 1988 Radio Amateur Callbook.*

For more information, write to, *Radio Amateur Callbook Inc., 925 Sherwood Drive, Lake Bluff, IL 60044, for your local dealer or circle Reader Service card number 40.*

## ICOM

The IC-900 is a six-band VHF/UHF mobile transceiver system featuring fiber-optic control of remote "band units." The compact controller, which measures only 2.9" x 2" x 1", can be placed in any convenient location near the operator, while the band units reside in some other spot in your vehicle (such as the trunk). The band units are connected to the controller by a fiber optic cable to eliminate rf feedback.



*ICOM's IC-900A VHF/UHF mobile transceiver.*

Among the features of the control unit are: 10 memories for each band, memory and programmable band scanning, and crossband operation. Band units are available for 2 meters (25/45W), 10 and 6 meters, 220 and 440 MHz, and 1.2 GHz. The basic control units, microphone, and external speaker retail for $589. The band units are available separately.

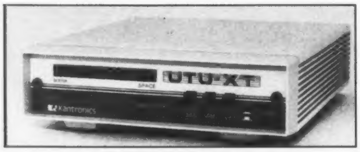
ICOM
IC-u2A
ICOM
BP-21

*The ICOM IC-u2A VHF FM transceiver.*

ICOM's new IC-u2AT is a pocket-sized 2m hand-held designed to cover 139-174 MHz on receive and 140-150 MHz on transmit. The Micro features ten memories to store frequency, offset and access tone; an LCD readout on the top panel; scanning; 1 Watt rf output; and 32 built-in subaudible tones. The HT weighs ½ pound and measures 2.3" x 5.6" x 1.1". It's price is $329. For more information contact *ICOM America, Inc., 2380-116th Ave. NE, Bellevue, WA 98004; 206-454-8155.*

## KANTRONICS

Accelerate your TNC-1 or TNC-2 into 2400 bps with the **Kantronics 2400 TNC Modem**. This add-on modem mounts directly above your TNC, and adds 2400 bps packet, while retaining 1200 baud packet operation with your original unit. The suggested retail price is $149.

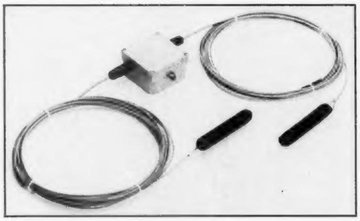


*The Kantronics UTU-XT modem.*

**UTU-XT/P** features user programmable parameters, over 100 software commands, and an RS-232/TTL jumper for universal compatibility to any computer with an asynchronous, serial I/O port. UTU-XT/P now operates HF PACKET; along with CW 6-99 WPM; RTTY from 45-300 baud; ASCII from 110-300 baud; and AMTOR, MODES A, B, and L. The user's programmable parameters allow you to specify shift and baud rate, vary Mark and Space tones, and change the center frequency and bandwidth of the CW detector. Since UTU-XT/P is microprocessor based, it has optimum filter settings for each mode, shift, and data rate selected. It also has the added features of push button selectable multiple RTTY shifts, and limiter/limiterless operation for maximum sensitivity. A 12-pole, programmable, switched-capacitance input filter is optimized for each selected shift. The suggested retail price is $290. For more information write or call, *Kantronics, 1202 E. 23rd Street, Lawrence, KS 66046; 913-842-7745.*

## POYNTEK

The Snyder Full-Band tm antennas for the 160, 75/80, and 40 meter bands allow maximum use of modern, broad frequency range transceivers and "no tune" power amps to 1000 watts. These wideband antennas for the low HF bands are based on patented technology and eliminate the need for antenna tuners and special radiator networks.



*One of Snyder's Full-Band™ wide band antennas.*

The three models, FB-160X, FB-75/80X, and FB-40X are constructed of high quality materials including space-age plastics and corrosion resistant, non-ferrous metals to provide low weight, low wind drag, and weather endurance for years. They also include optimized feed modules for near earth installations. Also included are SO-239 connectors to interface with a 50 Ohm coaxial transmission line and a pair of PL-259 terminated antenna radiator elements with end insulators and tie point eyelets.

The Snyder Full-Band tm antennas vary in cost; model FB-160X is $344., The model FB-75/80 is $230., and the model FB-40X is $160. For further information contact *Poyntek Associates, P.O. Box 741, Placentia, CA 92670; 714-993-7525. Or circle Reader Service card number 151.*

## BEL-TEK

The BEL-TEK CMOS Keyer Kit uses a triggered clock to completely eliminate the possibility of the first dot or dash being any longer than the character elements that follow. The instant you push the key the character starts, eliminating the delay often encountered in keyers with free running clocks. The digital circuitry of the CMOS keyer provides an exact 3 to 1 weight ratio for perfect CW. The keyer also provides jam-proof spacing, which eliminates the chance of placing dots and dashes too close together. The keyer automatically inserts an element space after a dot or dash is completed, even if a key was pushed before the completion of the space. If both the dot and dash keys are sent simultaneously, the dash will dominate until it is released. All of these features enable you to send effortless perfect code.

*The CMOS keyer from Bel-Tek.*

The keyer uses any voltage between 5 and 12 volts DC. The circuit is protected against accidental polarity reversal of the supply voltage. The keyer can operate at any speed between 5 and 50 WPM. The built-in 800 Hz sidetone has an adjustable volume control. The transistor will reliably switch loads up to 250 ma. The keyer is compatible with grid block, cathode keyed, and solid state transmitters. The price for the CMOS Keyer Kit is $9.95 plus $1.50 shipping. For more information write, *Bel-Tek, PO Box 125, Beloit, WI 53511. Or circle Reader Service card number 154.*

## ESOFT SOFTWARE

A low-cost electronic circuit design software program has been developed for the IBM-PC. The program called CompDes, is an easy to use menu-driven software tool that has main menu selections starting from Basic Electricity and continuing through Circuit Designs.

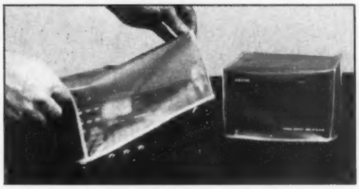
*The ESOFT Circuit design program for the IBM—PC and compatibles.*

Circuit calculations of resistance, decibels, VSWR ratio resonance, and etc. are possible with this software. It also has menu selections of circuit designs for transceivers amplifiers, transistor schmitt trigger circuits, passive and active filters using operational amplifiers, attenuators, and more. The software was developed by circuits design engineers with over 25 years of design experience, and covers a wide range of engineering topics. In addition to being a design aid, it also makes a great educational tool, and included in the software package is a design manual that compliments the software.

CompDes, comes with a non-copy protected disk and will operate on the IBM-PC/XT/AT/PCjr or any compatible. The cost of the complete package is only $50., and is available from *Esoft Software, 444 Colton Road, Columbus, OH 43207; 614-491-0832. Or for more information circle Reader Service card number 156.*

## AMHERST INTERNATIONAL

Cover Craft dust covers are available for more than 50 Ham equipment models as well as hundreds of computer and data processing models. Covers protect against dust, dirt, spills, pet hair and help reduce failures and repair costs. Each cover is DUO-FOLD ™ machine stitched for extra strength and inferior binding or piping is not used. The unique Anti-Static vinyl material has been tested to all government specifications, and is a must for today's solid state circuitry.



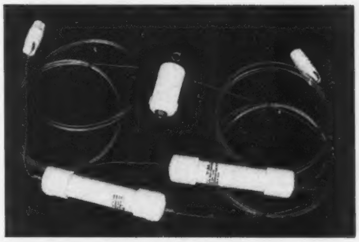
*CoverCraft ham radio equipment covers.*

The Cover Craft gives your Amateur Station that professional appearance. Our clear taffetta finished material protects but does not hide your equipment's appearance. Most of the models retail for $9. Send for a 20 page catalog to *Cover Craft manufactured by Amherst International Corp., 540 N. Commercial St., Manchester, NH 03101; 603-644-3555. Or circle Reader Service card number 167.*

## SPI-RO MANUFACTURING

Spi-Ro Manufacturing offers a complete line of Multi-band Trap Antennas, both dipole and vertical "sloper"types. Covering all amateur radio bands 160 thru 10 meters. It offers the ultimate in trap design. The traps are lightweight, sealed and weatherproof, and feature no-rust, solid brass terminals that do not require no soldering or jumper wires. The antennas handle full power and allow multiple band operation with a single antenna with automatic band-switching. The antennas use 50 Ohm coaxial feeds and have standard SO-239 receptacles.

They come factory assembled or in easy to assemble kit form. Prices start at only $39 postpaid in U.S. Catalog available showing models. *For more information circle Reader Service card number 250.*



*The Spi-Ro multi-band trap antenna.*

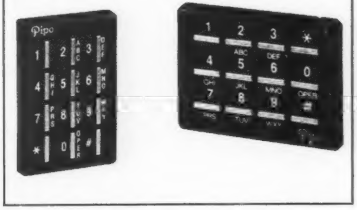
The **"High-Tech Arrestors"** protect transmitters, transceivers, receivers, and other sensitive communications equipment from harmful damage caused by lightning surges, transients, etc. The units utilize a gas filled discharge element, and a secondary stage to provide "double protection" to the equipment. The units restore themselves time and time again for repeated use. The High-Tech Arrestors divert unwanted voltage surges to a safe ground. They are rated up to 2000 watts for transmitter protection.

Prices start at $30. Models are available with UHF, BNC and N type connectors. For more information contact *Spi-Ro Manufacturing, Inc., P.O. Box 1538, Hendersonville, NC 28793. Or circle Reader Service card number 230.*

## PIPO COMMUNICATIONS

A high quality DTMF-encoder and keyboard designed exclusively for land mobile applications. Pipo Communications has developed a new keyboard for the land mobile industry, the P-7 Series of 12-key touchtone encoders. They come equipped with steel keys and sealed Gold Dome contacts. The miniature design will fit most radios. The encoders allow output level adjustment.There isn't any RFI, but there is very low distortion - High Audio Output will drive any radio. The wide operating voltage range is 4 - 16 vdc. Current requirements are low: 1 mA in standby and 6 mA keyed at 8 Volts.

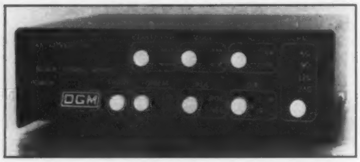
The P-7V and the P-7H both sell for $53. depending upon the amount wanted. For more information write or call *Pipo Communications, P.O. Box 2020, Pollack Pines, CA 95726-2020; 916-644-5444. or circle Reader Service card number 229.*



*The P-7V and P-7H 12-key touchtone encoders from Pipo Communications.*

## DGM ELECTRONICS, INC.

The FAX-1000 connects between your communications receiver and Epson graphics compatible printer. It allows you to print weather charts, satellite pictures and press photos. It will copy AM facsimile signals sent by weather satellites or FM facsimile signals, which are normally sent on HF. The FAX-1000 will copy all standard speeds and indices of cooperations. Pictures can be inverted or printed in either direction. A 10 segment bar graph allows you to accurately tune in the station copied. Automatic or manual copy modes are available. In the automatic mode the unit will wait for the appropriate signals from the sending station to start the frame finally stop printing. In the manual mode the operator can start the printing and manually frame the picture with a front panel button. Front panel LED indicators and pushbuttons make the FAX-1000 easy to operate.



*The DGM FAX-1000 FAX converter.*

The FAX-1000 is housed in a compact, attractive RFI proof aluminum enclosure. The unit is powered by a 110 VAC wall transformer, which is included. The FAX-1000 costs only $299. For more information contact:*DGM Electronics, Inc., 901 Elmwood Ave., Beloit, WI 53511; 608-362-0410. Or circle Reader Service card number 228.*

## ALDEN

Alden Electronics, Inc. has introduced a professional quality, low cost facsimile Weather Chart Recorder Kit for radio hams or anyone interested in receiving their own weather charts and weather satellite pictures at home or office. The easy to assemble kit provides a recorder that, when connected to a stable HF general coverage SSB receiver and suitable antenna, can receive weather charts, satellite pictures and oceanographic data from over 50 transmitter sites around the world.

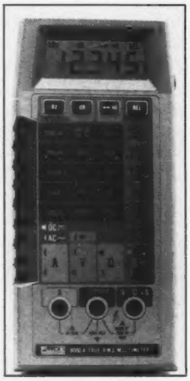
*The Weather Chart Recorder Kit from Alden Electronics, Inc..*

The kits can be completed in five or six hours. An illustrated, step-by-step assembly manual with separate operator's manual and a worldwide radiofacsimile frequency guide and broadcast schedule are provided. All major components and circuit boards are pre-assembled and tested. Once it is complete, it runs at 120 scans per minute on a standard 115 VAC 60 Hz power and consumes 30 watts when printing and 10 watts in standby mode. Low cost paper cassettes available from Alden provide approximentely 50 charts, 11 inches wide.

The Weather Chart Recorder Kit costs $995 plus $5 shipping and handling in the U.S.A. plus applicable state sales taxes. For additional information contact: *Alden Electronics, Washington Street, Westboro, MA 01581; 617-366-8951. Or circle Reader Service card number 227.*

## FLUKE

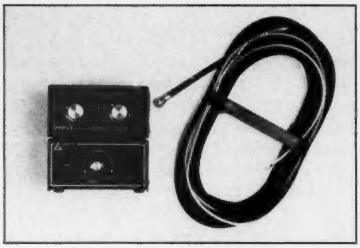
The Fluke 8060A Digital Multimeter is a handheld, microcomputer-controlled 4 ½ digit test instrument. It has performance and features that make it ideally suited for broadcast engineers and hams alike. In addition to the usual DMM functions of ac/dc voltage and current, and a wide range of resistance measurements, the 8060A offers frequency measurements to 200 kHz and relative and dB measurements with almost any impedance. The 8060A is the only handheld DMM with Hz, dB and relative measurement functions. These features are essential to quick, efficient troubleshooting of communications equipment.



*The Fluike 8060A Multimeter.*

The Fluke 8060A features 0.04% basic dc accuracy, and has a one year calibration cycle and warranty. It comes equipped with test leads and operator's manual. A full line of accessories allow the 8060A to measure temperature, high current, high voltage, and high frequency signals, plus a number of cases and test lead kits are available for opertor convenience. Suggested U.S. list price for the Fluke 8060A is $349. For the name of the nearest Fluke Distributer, or a free product brochure on the Fluke 8060A call toll-free 1-800-227-3800, ext. 229. For information on Fluke distribution opportunities, call toll-free 1-800-426-0361, or write *John Fluke Mfg. Co., Inc., P.O. Box C9090, Everett, WA 96206. Or circle Reader Service card number 226.*

## GROVE



*The Grove hidden antenna system.*

Grove's Hidden Antenna System solves apartment dwellers' dilemma. Grove Enterprises have solved the age-old question, "What's an apartment dweller to do for a shortwave or scanner antenna?" Grove is famous for their innovative and inexpensive solutions to communications problems. The Grove Hidden Antenna System combines a flexible antenna with a powerful, 30 dB gain preamplifier for continuous 100 kHz-1000 MHz receiving applications, making it ideal for indoor shortwave, longwave and VHF/UHF scanner listening, even TV and FM reception. The two output connections allow the simultaneous use of two receivers on the same compact antenna system. A separate preselector is also available to eliminate shortwave intermodulation and image interference in particularly troublesome installations.

The Grove Hidden Antenna System costs between $48 and $100 depending upon options. For complete information write,*Grove Enterprises, PO Box 98, Brasstown, NC 28902; 704-837-9200. Or circle Reader Service card number 225.*

## UNIVERSAL SHORTWAVE RADIO

Use your shortwave radio to see the world! Intercept and print fascinating facsimile (FAX) transmissions. See transmitted maps, photos, and charts from weather, press and military stations world wide.

*The Indo-Tech M-800 facsimile converter.*

The Info-Tech M-800 FAX Converter works with many dot matrix printers and your quality communications receiver and it is only $499 plus shipping. Contact Universal now for full information and you free pamphlet titled "Receiving FAX On Your Shortwave Radio", at *Universal Shortwave Radio, 1280 Aida Drive, Reynoldsburg, OH 43068; 614-866-4267. Or circle Reader Service card number 224.*

# THE MOST AFFORDABLE REPEATER

## ALSO HAS THE MOST IMPRESSIVE PERFORMANCE FEATURES

(AND GIVES THEM TO YOU AS STANDARD EQUIPMENT!)

| BAND | WIRED | KIT |
|---|---|---|
| 6M,2M, 220 | $880 | $630 |
| UHF | $980 | $730 |

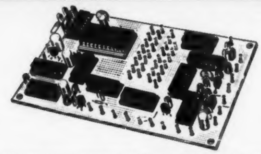
**(Also available for commercial bands!)**

hamtronics
REP100 REPEATER

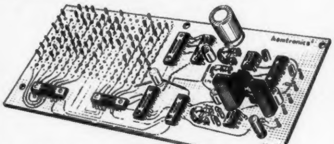
## FEATURES:

- **SENSITIVITY SECOND TO NONE!** 0.15uV Typ.
- **SELECTIVITY THAT CAN'T BE BEAT!** Both 8 pole xtal filter & ceramic filter for >100dB at ±12kHz. Helical resonator front end to combat desense & intermod.
- **Flutter-proof squelch**, Automatic frequency control, separate spkr amplifier.
- **CLEAN, EASY-TUNE TRANSMITTER**, up to 20W output. 50W with additional PA.

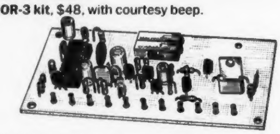
## ACCESSORIES



- **TD-2 DTMF DECODER/CONTROLLER kit only $78.** Full 16 digits, 5 functions, toll call restrictor, programmable. Much more. Great for selective calling too!
- **AP-1 AUTOPATCH kit only $78. Reverse patch & phone line remote control std.**
- **AP-2 Simplex Autopatch.** Use with above.



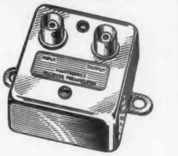
- **CWID kit**, new low price $48. Field programmable, timers, the works!
- **COR-2 kit**, $38. Audio mixer, local spkr amplifier, tail & time-out timers.
- **COR-3 kit**, $48, with courtesy beep.



- **MO-202 FSK DATA MODULATOR kit $38.** Run up to 1200 baud digital or packet radio signals through any FM transmitter.
- **DE-202 FSK DATA DEMODULATOR kit $38.**

## GaAs FET PREAMPS at a fraction of the cost of comparable units!

### LNG -(*) GaAs FET PREAMP

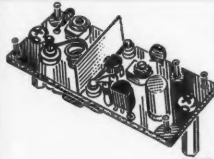


**ONLY $49! WIRED/TESTED**

**FEATURES:**

- **Very Low Noise:** 0.7dB VHF, 0.8dB UHF
- **High Gain:** 13-20dB, depending on freq
- **Wide Dynamic Range:** to resist overload
- **Stable:** new-type dual-gate GaAs FET

* Specify tuning range desired: 26-30, 46-56, 137-150, 150-172, 210-230, 400-470, or 800-960 MHz.



### LNW -(*) MINIATURE GaAs FET PREAMP

**Unbelievably Low Price - - -**

**ONLY $19/kit, $34 Wired/tested**

GaAs FET Preamp similar to LNG, except designed for **low cost & small size**. Only 5/8"W x 1-5/8"L x 3/4"H. Easily mounts in many radios.

* Specify tuning range desired: 25-35, 35-55, 55-90, 90-120, 120-150, 150-200, 200-270, or 400-500 MHz.

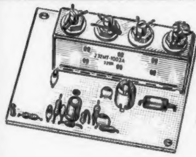
### LNS-(*) IN-LINE PREAMP

ANT
XCVR
PREAMP IN CKT
POWER
hamtronics
LNS TRANSCEIVER PREAMP

**ONLY $59/kit, $79 wired/tested**

GaAs FET Preamp with features similar to LNG series, except **automatically switches out of line during transmit.** Use with base or mobile transceivers up to 25W. **Tower mtg. hardware supplied.**

* Specify tuning range desired: 120-175, 200-240, or 400-500 MHz.



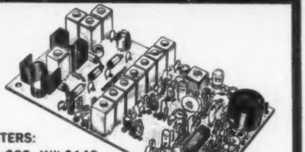
### HRA -(*) HELICAL RESONATOR PREAMP

**ONLY $49 VHF or $64 UHF**

Low-noise preamps with helical resonators **reduce intermod & cross-band** interference in critical applications.

* Specify tuning range desired: 143-150, 150-158, 158-162, 162-174, 213-233, 420-450, 450-465, or 465-475 MHz.

## HIGH QUALITY XMTR & RCVR MODULES FOR REPEATERS, LINKS,TELEMETRY, ETC.



- **FM EXCITERS:** Kits only $68. W/t $146. TCXO and xtal oven available. 2W cont. Up to 3W intermittent.
- **TA51 for 10M, 6M, 2M, 150-174, 220 MHz.**
- **TA451 for uhf.** FCC TYPE ACCEPTED FOR COMMERCIAL BANDS.
- **VHF & UHF LINEAR AMPLIFIERS.** For FM or SSB. Power levels from 10 to 45 Watts. Several models, kits starting at $78.

- **R144/R220 FM RCVRS** for 2M, 150-174, or 220 MHz. 0.15uV sens, 8-pole xtal & 10 pole ceramic i-f filters, helical resonator front end for exceptional selectivity, >100dB at ±12kHz (best available anywhere!) Flutter-proof squelch. AFC tracks drifting xmtrs. Xtal oven avail. Kit $138, w/t $198.
- **R451 FM RCVR.** Same as above but UHF. Tuned line front end. 0.2uV sensitivity. Kit only $138, w/t $198.
- **R76 VHF FM RCVR** for 10M, 6M, 2M, 220. As above, but w/o AFC or hel.res. Kits only $98 to $118.
- **R110 VHF AM RCVR** for VHF aircraft or ham bands or UHF. Kit only $98.

***NOW—FCC TYPE ACCEPTED TRANSMITTERS, RECEIVERS, AND REPEATERS AVAILABLE FOR HIGH-BAND AND UHF. CALL FOR DETAILS.***

## RECEIVING CONVERTERS

RECEIVING CONVERTER

**VHF MODELS**

**Kit with Case $49**
**Kit less Case $39**
**Wired w/case $69**

| Antenna Input Range | Receiver Output |
|---|---|
| 28-32 | 144-148 |
| 50-52 | 28-30 |
| 50-54 | 144-148 |
| 144-146 | 28-30 |
| 145-147 | 28-30 |
| 144-144.4 | 27-27.4 |
| 146-148 | 28-30 |
| 220-222 | 28-30 |
| 220-224 | 50-54 |
| 222-224 | 28-30 |

**UHF MODELS**

**Kit with Case $59**
**Kit less Case $49**
**Wired w/case $75**

| Antenna Input Range | Receiver Output |
|---|---|
| 432-434 | 28-30 |
| 435-437 | 28-30 |
| 432-436 | 144-148 |
| 432-436 | 50-54 |
| 439.25 | 61.25 |
| 902-928 | 422-448 |
| 902-922 | 430-450 |

## TRANSMIT CONVERTERS

For SSB, CW, ATV, FM, etc. Can be linked with receive conv for tranceive. 1 to 2 W out. Linear PA's available up to 50W.

**For VHF, Model XV2**
**Kit $79**
**Wired $149**
**(specify band)**

| Exciter Input Range | Antenna Output |
|---|---|
| 28-30 | 144-146 |
| 28-29 | 145-146 |
| 28-30 | 50-52 |
| 27-27.4 | 144-144.4 |
| 28-30 | 220-222 |
| 50-54 | 220-224 |
| 144-148 | 50-52 |
| 144-146 | 28-30 |

**For UHF, Model XV4**
**Kit $79**
**Wired $139**

| Exciter Input Range | Antenna Output |
|---|---|
| 28-30 | 432-434 |
| 28-30 | 435-437 |
| 61.25 | 439.25 |
| 144-148 | 432-436 |

**• Order by phone or mail • Add $3 S&H per order**
**(Electronic answering service evenings & weekends)**
**• Use VISA, MASTERCARD, Check, or UPS COD.**

### HAMTRONICS, INC.

**65-D Moul Rd.; Hilton NY 14468-9535**

☐ **High quality equipment at reasonable prices surely appeals to me; but I want more details before I buy! Rush my copy of the 40-page Hamtronics catalog by return first class mail. I enclose $1 ($2 for overseas air mail).**

Name ______________________________

Address ______________________________

City ____________________ State/ZIP ____________

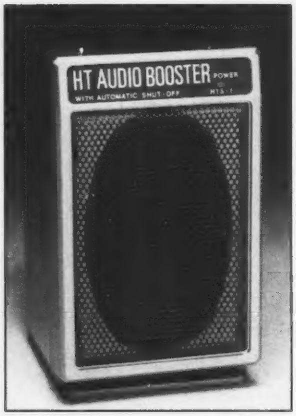
**hamtronics, inc.**

**65-D MOUL ROAD•HILTON NY 14468-9535**
**Phone: 716-392-9430**

*Hamtronics® is a registered trademark*

## NAVAL

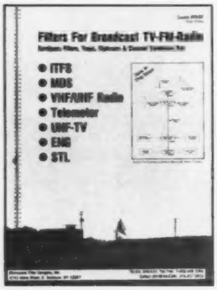
A battery operated, Amplified Speaker with a unique feature! If it senses no audio input for more than 60 seconds, it burps once and goes to sleep! While in the sleep mode the HTS-1 does not draw any current. No dead batteries because you forgot to shut it off! As soon as input returns, (like a breaking squelch) it comes awake and gives you a big speaker sound. It is yours for only $25. For more information contact *Naval Electronics Inc., 5417 Jetview Circle, Tampa, FL 33634; 813-885-6091. Or Circle Reader Service card number 223.*



*The HT Audio Booster amplified speaker from Naval Electronics.*

## MICROWAVE FILTER COMPANY

Microwave Filter's new edition of Filters for Broadcast TV-FM-Radio, BTV/87, describes bandpass filters, traps, diplexers and channel combiners for broadcast television and radio. One section describes ITFS bandpass filters for single channel or channel groups, and combiners for channel or two channel groups. Also included are filters for MDS. For ITFS/MDS systems, another section describes a video and aural combiner, a coupler which allows MDS to be added to an existing ITFS system and a bandpass filter that passes the entire ITFS and MDS band.



Filters For Broadcast TV-FM-Radio

- ITFS
- MDS
- VHF/UHF Radio
- Telemeter
- UHF-TV
- ENG
- STL

*The New Broadcast Filter catalog.*

Among other offerings in the catalog are multiband filters that allow other broadcast bands to be added to one tower, combiners and bandpass filters for UHF, ENG bandpass filters, interference traps, viewer and listener interference traps, distribution filters and TVRO interference filters. Filters with custom specifications may also be ordered. For a free copy of this catalog contact *Linda DeCoursey at Microwave Filter Company, Inc., 6743 Kinne St., East Syracuse, NY 13057.* Call toll free 1-800-448-1666 or collect 315-437-3953 New York, Hawaii, Alaska and Canadian residents. *Or circle Reader Service card number 222.*

## S-COM

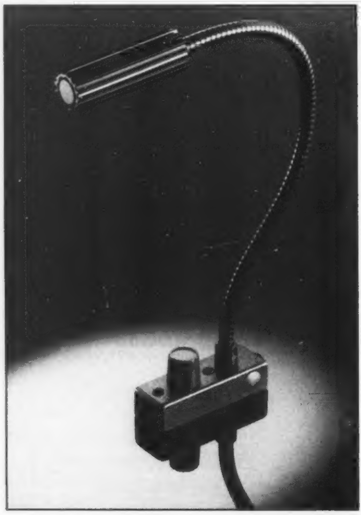
The S-COM 5K Repeater Controller is fully programmable via DTMF commands. Unlike other controllers, the 5K does away with the delays and reprogramming charges involved with custom ROMs; there are no jumpers or diodes to change. Data is retained in non-volatile memory, ensuring that no information is lost during power outages. The CMOS design draws little power, so it's perfect for emergency, portable, and solar-powered repeaters. Use 5Ks for main site control and control of remote receiver links.

*The S-COM 5K.*

For professional sounding audio with full squelch tail and DTMF elimination, add the 5K-ADM Audio Delay Module. It connects to the 5K through a single ribbon cable, and can be installed in the field. The optional 5K cabinet provides mounting for both the controller and the Audio Delay Module. Never before has such powerful control capability been available for $189. For more information write or call *S-COM, P.O. Box 8921, FT. Collins, CO 80525-0700; 303-493-8316. Or circle Reader Service card number 221.*

## LITTLITE

Littlite Lamps, the flexible gooseneck lamps with versatility and style, are ideally suited to any task involving accurate, close or detail work. Utilizing halogen technology, the High Intensity Series efficiently produces crisp, bright white light. The light is concentrated in a tightly controlled pattern easily aimed exactly where you need it. The Low Intensity lamp produces enough light for many tasks in dimly lit areas. With its low power incandescent light source this Littlite is best suited to applications where a high level of light is unacceptable.



*One of the Littllite Lamps from Littlite/CAE, Inc..*

"L" series sets come complete and ready for easy surface mounting. All sets are available in 6, 12, or 18 inch lengths with bulb, mounting base and fully adjustable dimmer. Each set also includes a 6 foot cord, a two piece snap mount, screws for permanent mounting, and a wall plug-in transformer for 120 volt operation. The Littlite prices range from $31 to $60. For more information write or call *Littlite/CAE, Inc., P.O. Box 430, 10087 Industrial Drive, Hamburg, MI 48139; 313-231-9373. Or circle Reader Service card number 220.*

## ANTENNAS WEST

The QRV 160-10, is a low visibility, all band HF antenna originally created for rapid emergency installation. Speed and ease of erection result from the use of special kinkproof wire. The result is a durable antenna easily installed by a single person. The QRV 160-10 is insulated and completely weather sealed, a feature that prevents corrosion from acid rain and air pollutants, thus ensuring quiet reception over the years. It may be connected directly to transceiver or transmatch with its PL 259 connector. The feedline may be extended as necessary with 50 Ohm coaxial line.

*The QRV 160-10 Antenna package.*

Based on the popular G5RV design, the QRV 160-10 measures 102 feet end to end, and can be installed in dipole, V, sloper or folded configurations. Unique adjustable insulators facilitate bending to fit available space. An extensive technical manual explains how to obtain desired results from difficult installation sites including spans as short as 26 feet. The QRV 160-10 is rated for full legal power. It comes ready to use and is priced at $50 including U.S. delivery. *Circle Reader Service card number 219 for more information.*

**The QRV-QL Quick Launch System** for Wire Antennas is a rapid system for hanging wire antennas from available supports up to 75 feet high without requiring exceptional strength or exertion. The system eliminates climbing, complicated paraphenalia, and the need to learn difficult skills.

The QRV-QL kit consists of a high visibility fluorescent projectile, twilight view kink proof launch line, safety protector, and a line carrier that also serves as a storage container for the kit. It comes with a manual detailing the method of most effective employment and reviewing safety considerations. The QRV Quick Launch kit comes ready to use and is priced at $13 including U.S. delivery. *Circle Reader Service card number 218 for more information.*

The QRV 160-10 Emergency Pack includes the QRV 160-10 antenna, the QRV-QL Quick Launch system, and everything else needed to install an effective all band antenna system. The Emergency Pack also includes a special Marconi adaptor and all band counterpoise, which quickly transform the antenna into an efficient top loaded vertical for low angle radiation on the 160, 80, 40, or 30 meter bands. Also included are a 70 foot coaxial feed- line extension with hand soldered, weather sealed connections and 200 feet of rot proof Dacron ™ support line. The entire package is contained in a weatherproof carrier bearing instructions and checklists on the outside.

The Emergency Pack is priced at $120 including U.S. delivery. *Antennas West, 1971 N. Oak Lane 1300 E., Provo, UT 84604-2138; 801-375-0247. Or circle Reader Service card number 217.*

*The ALD-24T Dual band mobile transceiver frtom Alinco Electronics Inc..*

## ALINCO

The ALD-24T Dual Band Mobile Transceiver is designed to be the ultimate in compact size with an impressive array of features, allowing maximum flexibility in automobile installations. Advanced engineering and technology make it possible to offer a complete dual band radio in a very compact package. The standard features include 21 memory channels, 2 VFOs, 25 W output, and Encode/Decode CTCSS. Repeater offsets are fully programmable, and the unit allows full duplex, cross band operation. Frequency coverage is 140-149.995 and 440-450 MHz. The ALD-24T dual bander is which is priced at $580.

For more information contact *Alinco Electronics Inc., 20705 S. Western Ave., Suite 104, Torrance, CA 90501; 213- 618-8616. Or circle Reader Service card number 216.*

*The Datong multi-mode Audio filter FL-3.*

## GILFER SHORTWAVE

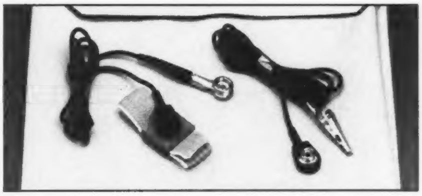
In one stylish case the Datong FL3 Automatic Audio Filter offers the complete solution to receiver audio processing. This filter automatically eliminates unwanted interference from tune-up tones or heterodynes 200-4000 Hz with a scanning, switched capacitor filter that phase locks to the undesireable signal. The user can manually tune a second notch filter 200-3500 Hz. The FL3 also features adjustable low and high pass filters with very sharp skirts. For CW and RTTY tuning, the individual filters' characteristics can be combined to yield a 10- or 12-pole filter, depending on the user's need. The FL3 is easily connected in series with any speaker or headphones and does not require internal modification to the receiver. The unit requires 10-15 Volts DC, 400 mA maximum.

For more information contact *Gilfer Shortwave, 52 Park Ave., Park Ridge, NJ 07656. Or circle Reader Service card number 215.*

## JENSEN TOOLS

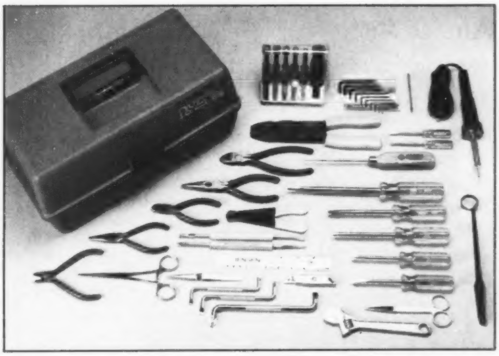
A Static Control Companion Kit has been designed by Jensen Tools to fit behind the upper pallet of a tool case or inside a briefcase. Essential for the protection of static sensitive devices in the field, the kit opens up to a full 18 x 24" static dissipative work surface with a 5 ft. grounding cord for the mat and adjustable elastic wrist strap with 4 ft. ground cord for the wearer. The kit includes hardware and instructions for correct hook-up to insure the safety of both the static sensitive components and the user. Meets or exceeds all applicable military and EOS/ESD standards. Only for $30.

For more information and free catalog of other products for electronic engineers and technicians. *For more information circle Reader Service card number 214.*


*Static Control Kit for field service personel, from Jensen Tools, Inc..*

Jensen Tools has a new tool kit for the advanced student of electronics and skilled hobbyist. Recommended also for small service shops and skilled home repair, the Deluxe Tech School Kit (#23B002) includes screwdrivers, nutdrivers, wire stripper/cutter, pliers, scissors, wrenches, hemostat, mirror, holding tweezer, soldering equipment and more. A total of 28 quality tools are furnished in a 13⅞ x 6⅞ x 7 inch durable plastic tool box with lift-out tray, positive latch and carrying handle. The kit is priced at $79.

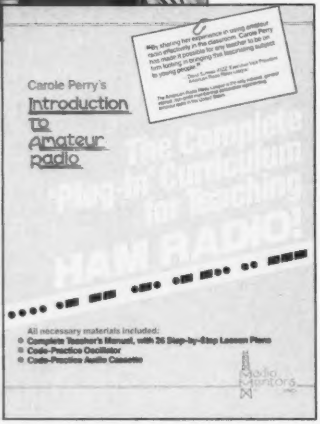
For more information and free catalog, write or call *Jensen Tools Inc., 7815 S. 46th St., Phoenix, AZ 85044; 602-968-6241. Or circle Reader Service card number 212.*


*The TELVAC Deluxe Tech School Kit from Jensen Tools, Inc.*

## MEDIA MENTORS INC.

At last a Ham Radio curriculm written specifically for the classroom teacher! **"Introduction To Amateur Radio"** contains a teacher's manual with 26 step by step lesson plans designed to motivate and instruct children of all abilities, a custom-made code practice oscillator, and a high motivational code practice audiocassette to follow the lesson plans. The material is based on 6 years of teaching the course at Intermediate School 72 to thousands of youngsters. The program encompasses all areas of a school's curricula, and can be taught as a course unto itself or as a unit in a science program. A 24 hour hot line is available to any teacher buying the program. The package includes homeworks, quizzes, enrichment activities, and reproducibles. The price for the whole package is $100. For additional oscillators is $20, and an additional cassettes are $7.

*Hands-on learning from Media Mentors, Inc.*


"By sharing her experience in using amateur radio effectively in the classroom, Carole Perry has made it possible for any teacher to be on firm footing in bringing this fascinating subject to young people."
Carole Perry's
Introduction to Amateur radio
The Complete Plug-in Curriculum for Teaching HAM RADIO!
All necessary materials included:
Complete Teacher's Manual, with 26 Step-by-Step Lesson Plans
Code-Practice Oscillator
Code-Practice Audio Cassette
Media Mentors

For more information contact Carole Perry WB2MGP, (Dayton Ham of the Year 1987). *Media Mentors, Inc., P.O. Box 131646, Staten Island, NY 10313-0006; 718-983-1416. Or circle Reader Service card number 211.*

## COM-RAD INDUSTRIES

A unique concept in a low profile antenna for radio communications is the Untenna Hi-Rizer. The antenna is a full-sized, 40 through 10 meter vertical, wound down to 15 inches in height to let you put it just about anywhere! It is continuously tunable from 7 to 30 MHz for Amateur, Commercial and Government Sermvice. The Untenna Hi-Rizer's model number is CR4010A. It is available for $117. plus $5. shipping and sales tax where applicable. The purchase price includes antenna, feedline and mount of your choice. Additional mounts are $15. each (and $2. shipping when ordering separately). The mounts available are a magnetic or a clamp mount for use on large metal surfaces. It is also available with its own ground screen when the use of a metallic surface is not convenient.

UNtenna
Hi-Rizer
*The Com-Rad Hi-Rizer UNtenna.*

For more information write or call *Com-Rad Industries, 25 Imson St., Buffalo, NY 14210; 716-823-0331 or 716-773-1445. Or circle Reader Service card number 210.*

## TEN-TEC

Meet America's newest full featured, synthesized transceiver. The Paragon, Model 585. Its general coverage receiver tunes 100 kHz- 29.9999 MHz, and it transmits at 100 watts output on all authorized frequencies. Included features are 62 full-function memories, dual VFOs, noise blanker, speech processor, RX and TX offsets, QSK with a changeover time of less than 30 ms, five IF filters that are front panel selectable independent of mode, selectable tuning rates, passband tuning, audio bandpass filtering, tone control, squelch, notch filtering and more. The sixty-two programmable memories that include frequency mode, filter selected, channel number and a 7 digit alpha-numeric tag for entering a net name, call sign or I.D. of your choice. The channels scanned are totally controllable with global lock-out, global reset and individual lock-out and reset. The frequency selection can be made using the main tuning knob, keypad direct entry or up/down buttons that can shift on MHz or to the next ham band.

*The Paragon Model 585 transceiver.*

The Paragon Model 585 is priced at $1995. If you want more information please contact *Ten-Tec, Highway 411 East, Sevierville, TN 37862; 615-453-7172. Or circle Reader Service card number 204.*

## COMPETITIVE COMPUTER SOLUTIONS

This company recently introduced an IBM PC/XT compatable computer system designed exclusively for the amateur radio operator. Called the HR8810 Computer, the system boasts a 640K 4.77/10 MHz externally switchable motherboard, two half-height floppy disk drives, a full compliment of input/output ports, a high quality CTX monochrome monitor, and an AT-style enhanced keyboard. Also included with HR8810 are special RFI reduction interface cables with foil and braid shielding and a copy of MS-DOS 3.21.

*The HR8810 IBM PC-XT made especially for amateur radio computer.*

The introductory price of the unit is, as the corporate name suggests, competitively priced at $900. For further information write to, *Competitive Computer Solutions, Inc., 5721 Bayside Road, Suite A, Virginia Beach, VA 23455; 804-460-9828. Or circle Reader Service card number 264.*

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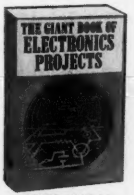
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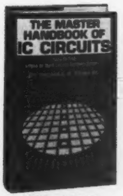
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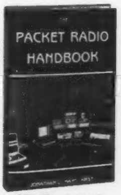
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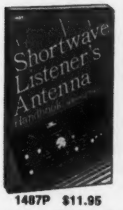
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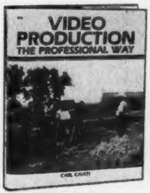
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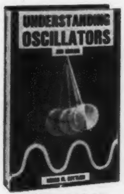
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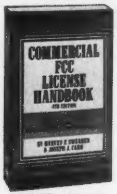
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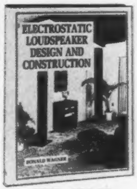
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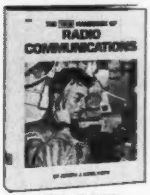
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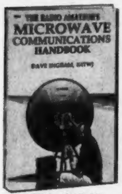
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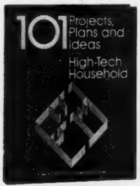
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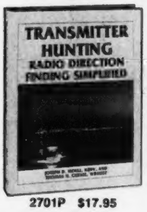
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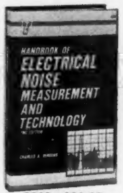
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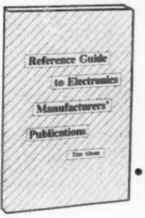
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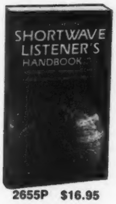
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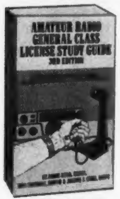
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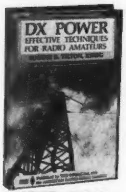
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CIRCLE 128 ON READER SERVICE CARD

# Clear Channel's Ranger AR-3300

## Affordable 10-meter Fun

Clear Channel Corp.
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*by Marc Stern N1BLH*

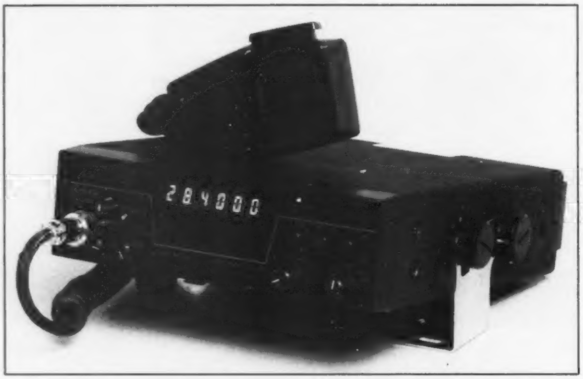

*Photo A. The Ranger AR-3500. The 3300 and 3500 models are identical rigs except for their final stages, which output 25 and 100 Watts, respectively.*

With all the hoopla over Novice privileges on 10 meters, you wonder why more manufacturers don't respond with multimode single-band rigs to give Novices exposure to HF operation?

Most of the industry might be missing a beat, but not Clear Channel of Issaquah, Washington. It offers two versions of its 10-meter monobander: the Ranger AR-3300 (25 Watts output), and the Ranger AR-3500 (100 Watts output). After using the AR-3300, I can say that Clear Channel has a product that the rest of the industry will have to contend with.

**A Full-Featured Rig**

A look at the specifications will confirm it is quite a capable transceiver. First of all, it features wide bandwidth that covers the whole 10-meter band, and it is totally microprocessor-controlled. It also sports multimode capability—AM, FM, CW, and both upper and lower sideband—so you can also use radioteletype.

Before continuing, a word about CB-to-10 conversion. Of course, you can convert a CB rig to 10 meters with the change of a crystal and retuning. But you limit your output to under10 Watts, and the CB rig's bandwidth limits frequency coverage. Most CB conversions allow only one mode of operation. So, while the CB conversion might seem economical, it really can't compete with a rig like the AR-3300.

The low-power version features 25 Watts output on CW and SSB peaks and 8 Watts output on FM. The high-power version features 100 Watts. When 10 meters is open, the low-power version is adequate. During the peak sunspot years of the last cycle, I had a lot of fun with mobile 10-meter sideband from a converted CB rig with 12-Watts peak-to-peak. Since we're several years from the sunspot peak, however, don't discount the 100-Watt rig.

The transmit section of the Ranger AR-3300 boasts carrier suppression that is better than 40-dB-below-peak output. Unwanted sideband suppression is better than 50-dB-below-peak output (using a 1-kHz tone) and spurious radiation is better than 50-dB-below-peak output.

Because it is synthesized and microprocessor-controlled, the AR-3300 is very stable. Frequency stability is better than 10 ppm after a 15-minute warmup. Maximum FM deviation is set at 1.5 kHz and the AR-3300 uses a low-impedance (500–600-Ohm) microphone.

On the receive side of the Ranger AR-3300 transceiver, image rejection is better than 70 dB and i-f rejection is better than 80 dB for all frequencies. CW and SSB selectivity is 4.2 kHz at −6 dB, and 8.6 kHz at −60 dB. For FM and AM, the selectivity figures are 6 kHz at −6 dB, and 18 kHz at −60 dB.

> ***"It is quite a capable transceiver."***

Sensitivity is better than 0.3 uV at 10 dB S/N for SSB and CW and better than 0.5 uV for 12-dB SINAD. The AR-3300 is both very sensitive and selective.

This rig is a dual-conversion superheterodyne receiver. The first i-f is 10.695 MHz and the second is the standard 455 kHz. Dynamic range is better than 100 dB.

For portable operation, the AR-3300 is ideal. Although it's no small-fry at 7 x 9 x 2.5 inches and about 4 pounds, it is still a lot less to carry than the standard 100-Watt mobile rig. Also, with the low power AR-3300, you'll find you can use a small power supply to run it at your home station. A gel cell or an auto battery can serve as a convenient power supply for portable operations. The low-power version draws up to about 4 Amps on voice peaks or about 2.5 Amps on FM. The high-power version should draw about 20 Amps on peaks.

Speaking of voice peaks and audio, the AR-3300 delivers more than enough good audio at 2 Watts output. You should find that you'll hear CW or sideband even in a relatively noisy environment.

**Operation Controls**

The rig does not have a frequency selection knob in the center. Instead, Clear Channel has opted for a series of 6 rocker switches. Each one controls a segment of the 6-segment display. The buttons also control scan rate and direction. The frequency display gives you resolution to the nearest 100 Hz.

Just below the frequency control switches a series of momentary contact mode buttons determine how the rig will scan (programmed or memory). Just to the right of the frequency control switches three pushbuttons control offsets for repeater work. The rest of the front panel consists of controls for microphone and rf gain; the receiver incremental tuning (RIT) control; all-mode squelch; function selector (AM, FM, CW, USB, LSB); and the AF gain control. LED bar meters indicate received signal strength and transmitted power output. Other LEDs indicate operating mode (transmit, receive, standby, split).

The selected memory channel is also highlighted with an LED.

The rear panel consists of a large heatsink; antenna connector (standard SO-239); and jacks for an external speaker and CW key (a miniature plug). There's also the 13.8-Vdc input connector.

### Recommendations

I found the AR-3300 to be a very good rig, but there are a few minor annoyances.

The speaker has been placed on the bottom which means that if you use this on a car seat or attach it to the floor, then most of the audio is directed downward and is muffled. If you're going to mount it, I would suggest putting it under the dash to get the full effect of the speaker. And, if you're using it at home, I suggest using the mounting bracket as a tilt bail so the audio bounces off a table surface.

Also, the RIT control is limited to about 500 Hz above and below the center frequency. It does an adequate job for signals that are quite near the frequency in the yellow-green display, but you'll find that you have to punch the frequency change buttons to zero in on the signal. I suggest more RIT range as a future improvement.

Another point is the all-mode squelch and scanning. The rig will scan a programmed range until it encounters a signal that breaks the squelch. Several times, though, when I compared AR-3300 with others I have, I found that the AR-3300 wouldn't stop on signals I thought it should have. When I loosened the squelch, the signals heard on the other rigs were present. Apparently, the AR-3300 requires a relatively strong signal to open the squelch.

> ***"I wanted a frequency selection dial."***

Although I suspect many operators won't be troubled by this, I wanted a frequency selection dial. When I wanted to search through a range of frequencies (without setting the scan), I found it very awkward to have to keep pushing the frequency selection buttons to move up or down in the band. Setting the scan feature wasn't convenient when all I wanted was to casually roam up and down the band. Clear Channel should think of adding a small frequency selection knob to the front of the rig, rather than relying totally on the scan mode. There is more than enough room inside and out to make the addition.

### Excellent Choice

Despite these drawbacks, however, the AR-3300 performed very well. For example, the programmable split capability made repeater operation easy. Further, the five memories made it easy to check five of my favorite frequencies when I used the AR-3300. The scan rate was more than adequate, too.

Memory retention, by the way, must be set by turning the squelch control to reset which enables storage voltage so the AR-3300 retains memory.

The AR-3300 remains an excellent choice for full-featured 10-meter operation. It's a rig that occupies an enviable market niche and, in fact, it should spur the market itself. ■

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*Marc Stern N1BLH frequently contributes to our pages. His professional interests include documentation for electronic systems.*

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*Continued from page 13*

the wrong part of the cycle could cause the switching transient to double the voltage and blow capacitors. My coil uses capacitors with a voltage rating which is twice that of the primary circuit, so I do not use a variac on my system. Set the gaps on the spark gap plates to about ⅛ inch on each gap, then, using alligator clips on the power leads, to the Tesla primary. Tap onto the primary at about 2 turns in from the end of the winding. When you are sure everything is connected correctly, plug in the power and bring up the variac slowly. At this point a loud crackling noise will become evident as the primary circuit spark gap breaks down, the spark from this gap should be blue and bright.

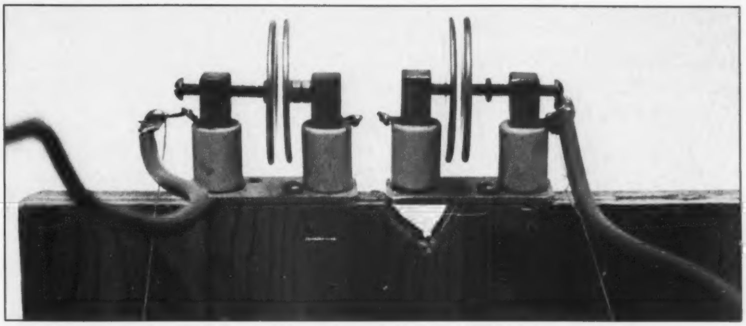

*Photo C. Tesla primary spark gap setup as described in text.*

With the lights turned down, a corona at the top of the secondary should be plain to see. Further adjustment to ⅛ turn on the Tesla primary should bring improved results. You will also find that fine adjustment of the spark gap also leads to improved results, since the gap has some effect on the frequency of operation. In some cases the bottom end of the secondary must be wrapped in polyethylene to prevent discharge between the primary and secondary. I had no problems bringing my Tesla coil to resonance with the hit and miss method. However, for those with a signal generator and oscilloscope, one can tune up the system more scientifically.

For those readers with such equipment, you can tune up the coil as follows: First, isolate the secondary and place a few loose turns of wire around the bottom of the secondary and connect this wire to a signal generator covering 150-450 KHz. Next, connect the top electrode to the vertical input of an oscilloscope through a 1 megohm resistor. Take the bottom connection of the secondary and hook it to the ground terminal of the scope. Adjust the frequency of the signal generator until the rising signal amplitude of the coil's self-resonant frequency is observed. If you built the secondary according to the plans in this article, you should find the self-resonant frequency to be around 380 KHz. The primary coil must resonant with the secondary, so it must be tuned also.

To tune the primary, the spark gap must be shorted to effectively put the capacitors in parallel with the primary. Connect the oscilloscope across the primary and inductively couple the signal generator to the primary. The signal generator is generating the same signal used to detect resonance in the secondary. Adjust the alligator clips on each side of the primary's center tap until resonance is observed on the scope. The secondary's form should not be anywhere near the primary for this operation.

### Start the Show

My Tesla coil is put into operation whenever guests or nephews arrive at my home. It has also been demonstrated at our local college for the electronics and physics departments. The reaction is always the same. The sight of lightning bolts close up, made on demand, is really something to be seen.

---

*Jon Enoch is an electronic technologist for a Canadian research and development company.*

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# Cubic Inch Keyer

## *Enjoy comfortable iambic keying on the HW-8*

The recent purchase of an HW-8 QRP transceiver rekindled my interest in CW. The code may not be as exciting as packet or some of the other new facets of amateur radio, but many enjoy it. It is good at producing usable contacts at very low power levels. But as I went about gathering the accessories for my first QRP foray into the woods, I ran into a snag. What to use for a CW key? My J-38 style key on its heavy brass base was on loan to a couple of fledgling novice friends.

I tried another key and a few homemade substitutes and made a discovery—without a solid base on the key and a table to rest both the key and my arm on, I don't send very good code! I hope to take the rig places where there aren't tables, and since they are darned difficult to backpack, I had a problem. Besides, I've been spoiled by the keyer in the "Big Rig" and the sweet Bencher paddle I have attached to it. Some experimenting with the Big Rig proved that I can send much better code using a keyer and paddle than a straight key in positions likely to be encountered while camping. My goal was clear—I needed to build a keyer suitable for taking camping with the rig. But was it practical?

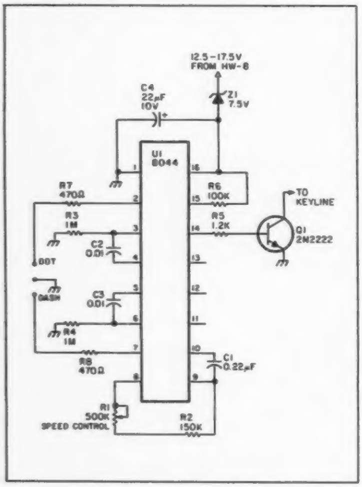

*Fig. 1 Schematic for the Cubic-inch Keyer.*

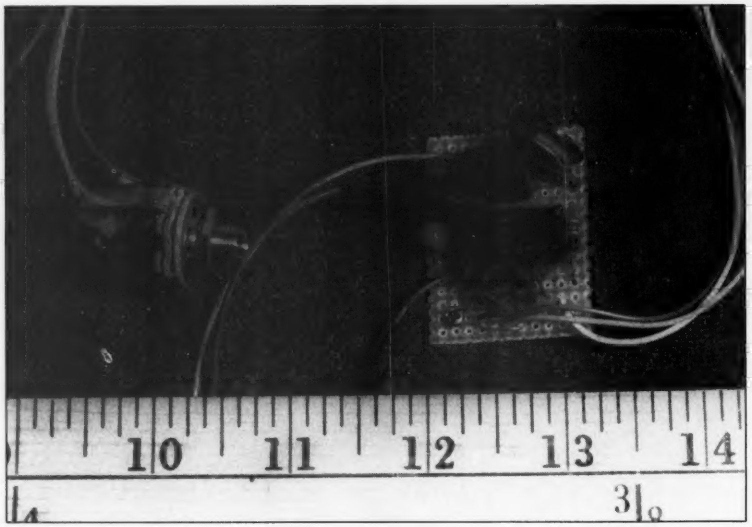

*Photo A. Top view of the keyer.*

It would have to be small enough to fit into the rig; I didn't want any more boxes and cables to worry about. It needed to be simple enough to complete quickly since I have enough grandiose—and unfinished—projects around. And it would have to draw low current to minimize the load on the station battery power supply. After searching through literature dealing with keyer designs, I settled on the keyer ICs produced by Curtis Electro Devices. These 16- and 18-pin DIP packages handle nearly all of the keyer functions on the single chip. They are CMOS and draw almost no current. They feature self-completing dots, dashes, and spaces; built-in sidetone generator, weight control, key debouncing, and good rf immunity. Both single-lever and iambic (squeeze) paddles can be used with them. They sounded perfect.

### Putting on the Squeeze

A quick call to Curtis got the differences between the various versions of the keyer chips sorted out. They produce 4 basic keyer ICs. The 8044M is an 18-pin DIP basic keyer with provisions to drive a speed meter directly. The 8044B keyer chip operates with a special squeeze key mode. An extra element opposite the last one sent is sent when the squeeze lever is released. The 8044BM has both of these features, and the 8044 has neither. Since I have never used the special squeeze technique and had neither the need or the space for a speed meter, I chose the 8044. I placed the order during the same phone call and three days later the chip arrived. After a few minutes of peering at the documentation and sample keyer schematic supplied, I dragged out the CSC Protoboard and sat down in front of the junkbox to do some breadboarding. The circuit shown evolved.

Looking at the left side of the keyer schematic, pins 2 and 7 are the connections to the keyer paddle. The R and C networks associated with pins 3 and 6 provide the timing for the debounce circuitry. The element timing network has its resistor across pins 8 and 9 and the associated capacitor across pins 9 and 10. The capacitor should be a stable type such as mylar™ dielectric. Curtis does not recommend the use of disk ceramics here. The application note suggested that C1 be a 0.15uf, and R1 and R2 be 500k and 100k, respectively. I couldn't find a 0.15uf mylar

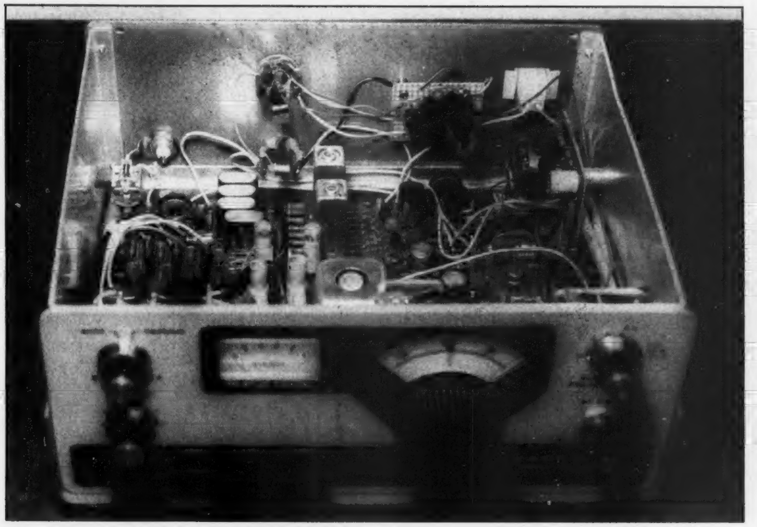

*Photo B. The Keyer and jack installed on the inside rear panel of the HW-8.*

*Photo C. WB2EMS and the Cubic-inch Keyer in the field.*

capacitor, so I used Kevin's first law of homebrewing: "If you don't have the right size, use what you have and adjust the part connected to it accordingly!"

I used a 0.22uf mylar capacitor at C1. A 150k resistor at R2 worked well with it on the breadboard to give me a comfortable speed range. High-speed CW operators might want to reduce R2 back to 100k, or lower C1 to the recommended value (.15uf) to shift the speed range more toward the top end. I mounted the speed control pot R1 on the circuit board instead of on the outside of the rig. I find that I operate at pretty much the same speed most of the time, and if I need to slow down I just increase the spacing between the characters producing a Farnsworth-type spacing. It would be a simple matter to run leads to a pot mounted on the rear of the HW-8's chassis for external adjustment.

Continuing up the right side of the chip, pins 11–13 are associated with the timing and drive for the sidetone generator in the chip. Since the HW-8 has its own sidetone, these pins are not used and so left open. Pin 14 is the output from the keyer. It swings positive when the keyer is making an element and rests at ground during the spaces. The HW-8 needs to have its keyline pulled low to send an element, so Q1 is used to invert the signal and provide sufficient current sink capability. The base drive is limited by R5. This arrangement should work with almost any battery-powered rig that has a positive voltage that must be pulled down to key, with currents up to about 50 mA. Transmitters in which all of the current in the final amplifier runs through the keyline might need a huskier transistor at Q1 and some more base drive.

Pin 15 is the manual key input and also the weight control pin. The rig already has provisions for a straight key, and a 1:1:3 weigh ratio is fine by me, so in the interests of simplicity, this input is unused. You can't totally ignore it, however; it must be pulled up to Vdd through 100k. I forgot and the chip started breaking into spurious oscillations after a few seconds each time it was turned on until I put the resistor in.

Pin 16 is Vdd, the positive supply input and pin 1 is Vss, or ground. A 22uf capacitor bypasses the chip. The zener diode is used to drop the 12–16 volt supply at the radio to within the 5–10 volt operating range of the 8044. I looked at several different ways of developing a fixed, stable voltage source. Unfortunately they all used more current by themselves than the entire keyer draws! Even though the supply voltage to the keyer will vary as the battery input to the HW-8 sags, I have not noticed any real problem yet. I tested the keyer/radio combination over a 9–16 volt range. A slight slowdown at the lower voltage was just noticeable, but the HW-8 was sounding rather sickly at that point anyway. The circuit only draws 50 microamperes most of the time, and just about 3 milliamperes when the elements are being sent and the base of Q1 is being driven. A nine-volt battery would power it for a long time. If I had only a battery clamp for a transistor battery instead of the zener on hand, the keyer might well have featured a "self-contained" power supply!

## The Final Version

After breadboarding the circuit and adjusting component values, it was time to build the final version. I used point-to-point wiring on a small piece of perforated vectorboard. The IC was socketed as recommended by Curtis, and I had to drill 3 holes in the board to mount the potentiometer. The resistors were mounted vertically to conserve board space. I made no attempt to seriously miniaturize the unit, but the choice of a physically smaller capacitor and potentiometer and 1/8-Watt resistors would probably allow the unit to be shrunk to half its current size. As it stands now, the keyer measures about 1.50 x 1.00 x .750 inches, or just a bit more than a cubic inch, hence the name.

I installed the keyer in the HW-8 along the rear of the cabinet by using a single post and some 4-40 hardware to support it off the rear wall. A 3-terminal jack was installed for the paddle to plug into just above the standard key jack. Power was taken from the power switch on the front panel and the keyline and ground were taken from the original key jack. The unit checked out fine when first powered up. The only quirk it has is that it always sends a single dash as soon as it is turned on. This could be avoided by connecting the keyer power line to the battery side of the power switch instead of the radio side. That way, whenever the battery is connected, the keyer would power up. In that case, if the HW-8 was not turned on at the time, the dash sent would have no effect. I prefer to have the power switch turn off everything, so I live with the dash.

Adding the keyer to the little rig has made operating it a real pleasure. Using a paddle works out just fine when camping, and I found a lightweight second paddle to dedicate to the task. The first field test was on a north country fishing trip. The rig was packed up on the motorcycle and survived the bouncing ride and a flat tire to perform splendidly at a rented cabin for several days until the battery ran down. I have even taken to using it at the home station for casual contacts instead of the "Big Rig," propping it up on the arm of my easy chair along with the Bencher paddle and running a piece of coax over to the station antennas.

My goal was to build a simple keyer with a low current drain of small size and with good performance. With a maximum drain of 3 milliamperes, a size of just over a cubic inch, and performance equal to the keyer in the "Big Rig," I feel the goals were accomplished. There's only one problem. Since they enjoyed playing with it so much on the fishing trip, the HW-8 and built-in keyer are now on loan to my friends, KB2ATZ and her OM KB2AUA. Oh well—they gave me my straight key back! 73! ■

*John K. Nally KA3AAQ*
*2934 Banks St.*
*Harrisburg PA 17103*

# Repeater Controller PC Board

## *How to get back on the air again quickly if your microprocessor-controlled repeater dies.*

In this modern day of microprocessor-controlled radios, it's rare to find a repeater that doesn't speak to you in its synthesized voice. Many repeater clubs have paid thousands of dollars for these machines that can speak hundreds of words in male or female voices. They do everything under the sun except fix themselves or detect a dying memory backup battery. Now, here's how to get back on the air quickly with an inexpensive repeater controller board when your repeater is on the fritz.

As useful as these silicon-based brains have become, they still have one major drawback: Once one dies, the repeater remains dead until someone skilled enough can fix it. This can render a busy repeater useless for days or weeks until the controller can be reinstalled and reprogrammed.

### Constructing the Board

An inexpensive repeater controller board can now be built in a few hours with off-the-shelf parts and kept for emergencies. It does not have an autopatch or IDer, nor is it run by a microprocessor, but it *will* get you on the air again quickly.

My repeater controller board is a combination of several basic circuits containing the standard hold-over timer (HOT) and time-out timer (TOT). It has the option of keying up a transmitter by VOX. When using VOX, audio from the receiver's audio stage or speaker brings up the transmitter. It is not necessary to open a radio and dig into its squelch circuitry to find a point that operates a carrier-operated relay (COR).

The heart of the circuit is a combination of two 555 timer ICs, one used as the HOT and the other the TOT, and a CMOS 4001 quad NOR gate which performs a variety of functions. I chose the 4001 because it has four separate NOR gates—each gate with two inputs—which can accommodate one or two separate conditions to activate the repeater (such as COR and PL).

Pins 13 and 12 of NOR gate A must both be at a logic low, making pin 11 high to activate the repeater. I'll call pin 13 the COR input and pin 12 the VOX/PL/Burst input. DIP switch 1 is set OFF (or open) if the COR input is used, and DIP switch 2 is set OFF (or open) if the VOX/PL/Burst input is used. If not using one of the inputs, setting its respective DIP switch to ON (or closed) will pull the gate low and enables it, allowing transmitter keying information to activate the other gate input.

The COR gate, if used, can be pulled low by a logic low through CR-1, or by 2 volts or more to the base of Q-1 which inverts it to a low. The VOX/PL/Burst gate can be pulled low through CR-2, or by 2 volts or more through CR-2 to the base of Q-2 which inverts it to a low. Diodes CR-4 and 5 are used for different inputs to Q-2 for several functions. CR-3 and CR-4 are used if a "Tone Burst" is needed to initiate the repeater after the TOT has timed out, either by actual carrier timeout or non-use. CR-5 is used when using VOX (CR-3 and 4 must be removed) and rectifies the audio from the LM-386 (used as the VOX driver) to turn on Q-2.

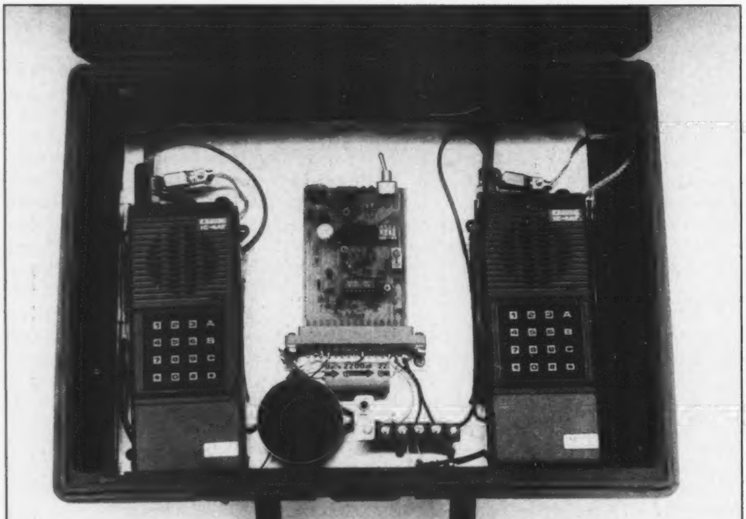

*Photo A. Repeater controller PC board with 2 ICOM 4ATs in a portable repeater package, mounted on an aluminum plate.*

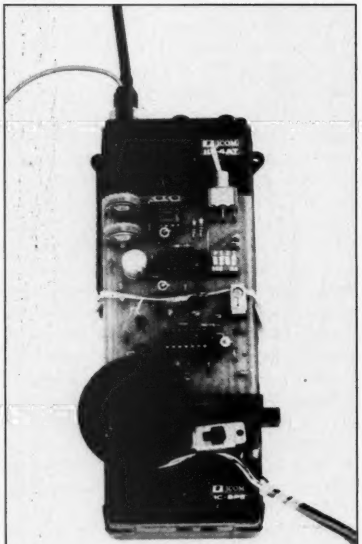

*Photo B. Repeater controller PC board attaches to an ICOM HT with a rubber band for fast emergency repeater use.*

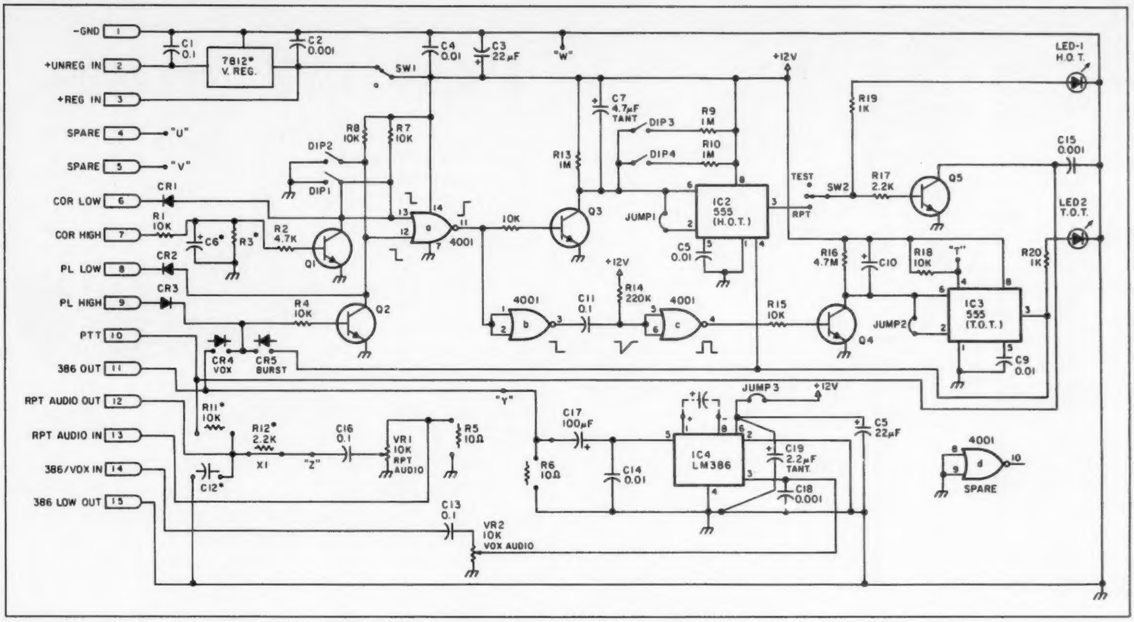
-GND 1
+UNREG IN 2
+REG IN 3
SPARE 4 "U"
SPARE 5 "V"
COR LOW 6
COR HIGH 7
PL LOW 8
PL HIGH 9
PTT 10
386 OUT 11
RPT AUDIO OUT 12
RPT AUDIO IN 13
386/VOX IN 14
386 LOW OUT 15
C1 0.1
7812* V. REG.
C2 0.001
SW1
C4 0.01
C3 22µF
"W"
+12V
LED-1 H.O.T.
R19 1K
C15 0.001
LED2 T.O.T.
C7 4.7µF TANT
DIP3
R9 1M
DIP4
R10 1M
R8 10K
R7 10K
DIP2
DIP1
CR1
R1 10K
C6*
R3*
R2 4.7K
Q1
CR2
CR3
R4 10K
Q2
a 4001
10K
Q3
R13 1M
IC2 555 (H.O.T.)
JUMP1
C5 0.01
TEST
SW2
RPT
R17 2.2K
Q5
R16 4.7M
C10
R18 10K
"T"
R20 1K
IC3 555 (T.O.T.)
JUMP2
Q4
C9 0.01
+12V
R14 220K
4001 b
C11 0.1
4001 c
R15 10K
CR4 VOX
CR5 BURST
"Y"
JUMP3
+12V
C17 100µF
IC4 LM386
C5 22µF
C19 2.2µF TANT
C18 0.001
R11* 10K
R12* 2.2K
X1
"Z"
C16 0.1
VR1 10K RPT AUDIO
R5 10Ω
R6 10Ω
C14 0.01
C12*
C13 0.1
VR2 10K VOX AUDIO
4001 d SPARE

*Fig. 1. Schematic for the repeater controller board.*

Proper conditions of pins 12 and 13 make the gate's output, pin 11, assume a high logic state. Subsequently, the logic high goes to the base of transistor Q-3, which pulls down the timing capacitor of the HOT 555 timer to a low logic state. The timer's output at pin 3 then turns on as long as the output of NOR "A" gate is high. The time delay, usually about 3 seconds, is set using C-6 and R-13. The timer's output turns on transistor Q-4 and keys the transmitter.

The output of NOR gate "A", pin 11, also affects the input of NOR gate "B". This gate now acts as an inverter and its output at pin 3 goes low to discharges capacitor C-11. As this capacitor discharges NOR "C" input pins 5 and 6 momentarily assume a low logic state. The gate inputs stay low until C-11 is again charged through R-14. During this low state the gate's output, pin 4, goes high for several milliseconds and turns on Q-4.

Transistor Q-4 then discharges the timing capacitor of the TOT, C-10, and causes the TOT 555 output pin 3 to go high. This output is connected to pin 4 (RESET) of the HOT 555, enabling it to key the transmitter. The TOT resets to its maximum time (typically 90 seconds to 3 minutes) every time the output of NOR gate "A" goes high (i.e., every time a carrier is initially detected). If the beginning of a carrier is not detected within the allotted time envelope of the TOT, its output will go low. The HOT's reset pin will assume a low logic state thereby turning off the transmitter. In the event of timeout, a momentary break in the repeater user's transmission will re-enable the repeater.

Note the unusual wiring configuration of both 555 timers. Pins 2 (trigger) and 6 (discharge) are tied together, and pin 7 (threshold) is not used. Also note that both timing capacitors, C-7 in the HOT and C-10 in the TOT, are connected to the working voltage (Vcc) bus and NOT ground. This allows us to use the 555s as "Missing Pulse Detectors" without using additional components shown in manufacturers' information manuals. The same timing formula is still used,

$$T = C \times R \times 1.1$$

where the timing in seconds = capacitance in mF times resistance in megohms times 1.1. Use only high quality tantalum capacitors with values up to 100 uF. The timing resistors should not exceed resistance values over 10 M.

If a TOT is not desired, do not install the TOT 555 on the PC board, or use IC sockets and simply remove it. The HOT will work as long as its pin reset pin, 4, is held high. This pin is internally pulled high, but good design practices say it should be tied high externally to the + supply line.

The LM-386 is a general purpose 400 mW audio amp requiring a minimum of external components. It can be used for a variety of applications: A VOX driver, a line driver, an amplifier to drive a small speaker, and as an audio preamp for some transmitters requiring amplified mikes. Pins 1 and 8 of the LM-386 determine its gain. If the two pins are not used, the voltage gain is about 22. If a capacitor (any value of 2.2 to 10 uF) is connected to these two pins, the voltage gain is about 200. For our purposes we usually will not need the extra capacitor.

The LM-386 will operate anywhere from 5 to 12 volts; be certain not to subject it to more than 15 volts. The output of the LM-386 is pin 11 of the edge connector. If using the LM-386 as a VOX driver, I recommend using a 10 to 12 volt working voltage. This will produce peak voltages high enough to turn on Q-2 after being rectified by diode CR-4. Also, if using VOX, make sure there is a load on the LM-386 output. If a loudspeaker is not needed, the output MUST be terminated with R-6, a 10-Ohm resistor. If the output is not terminated, C-17 will charge high enough to keep Q-2 turned on.

**Assembly and Testing**

The Repeater Controller can be assembled on small, single-sided PC board with a standard 15-pin, .156 spacing edge connector for easy installation. There are several types of switches available for the power and repeat/off/test switch. If not needed, simply place jumpers in the proper holes. The repeat/off/test switch can be vertically mounted, or, if using the board in a "card cage", can be a 90-degree type to make it accessible from the backplane. I designed the PC board to accommodate switches and eliminate the need for an additional control panel.

There are three jumpers required on the board: Each 555 requires a jumper on the *solder* side of the PC board between pins 2 and 6 (JUMP-1 and JUMP-2). Use insulated wire or sleeving. JUMP-3 is on the component side of the board and connects the LM-386 to the Vcc line.

The voltage regulator is only required for input voltages over 13 volts. Except for using VOX, all circuits will work equally well anywhere from 5 to 12 volts. If using VOX, the working voltage should be from 9 to 13 volts to derive a higher peak output value to be rectified and turn on Q-2.

The 4001 quad NOR gate has an unused spare gate which can be used for custom

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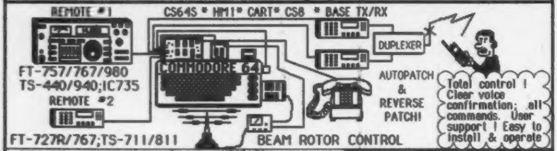
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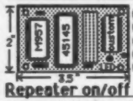

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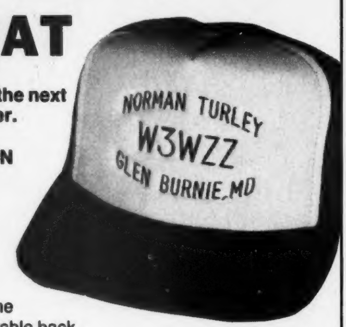

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"HAL"
HAROLD C. NOWLAND
W8ZXH

CIRCLE 175 ON READER SERVICE CARD

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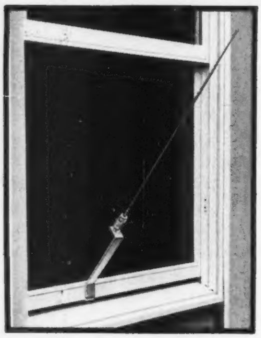
# PORTABLE ANTENNA



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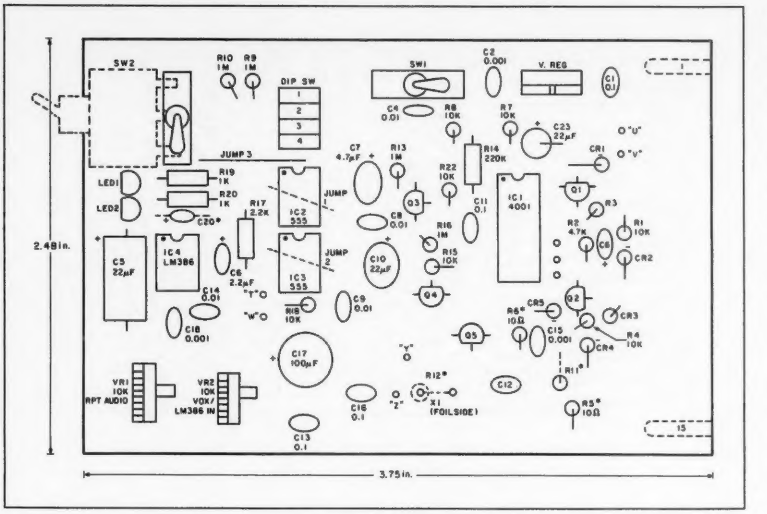

*Fig. 2. Parts layout.*

applications. I have tied the inputs low, so don't forget to break the traces if you decide to use them.

VR-2 regulates audio to the LM-386 amp. VR-1 is used for adjusting the proper audio level to the transmitter. If the repeat audio sounds "tinny", cut the trace at X-1 on the solder side of the PC board and install a low-pass filter, consisting of R-12 and C-12. I found that using a 2.2k resistor at R-12 and inserting a capacitor substitution box will allow a proper value to be easily found while listening to repeat audio. A fixed value can then be installed at C-12. If R-11 is needed, the value of R-12 can be critical if R-11 is below 6.8k.

If audio is used from a radio's external speaker jack, the internal speaker will probably disconnect. If an external speaker is not used, a 10-Ohm load resistor, R-5, should be used on the PC board. If this resistor is not needed, use a small value decoupling resistor in its place. Adjust the volume control from 1/3 to 1/2 open to assure proper frequency response if the speaker amp feeds repeat audio.

The DIP switch sets the time of the HOT and selects the configuration used to key the transmitter. It can also be used for testing the board. To test the HOT and TOT, set all 4 DIP switches to OFF (or OPEN) and apply power to the board. Neither LED should be on. Set switches 1 and 2 ON (or CLOSED) and both LEDs should turn on. Next, set switch 1 OFF; the HOT LED should stay on for about 5 seconds, and the TOT LED should stay on for the time determined by C-10 and R-16. Then set DIP switch 1 OFF and switch 2 ON. The HOT and TOT LEDs should stay on for the same times as in the previous step.

DIP switches 1 and 2 add parallel 1-M resistors, R-7 and 8, across the timing resistor, R-13, of the HOT. If using a 4.7 uF timing capacitor at C-7 and R-13 is 1 M, one of the DIP switches on will produce a timing of approx. 2.5 seconds, and 1.75 seconds with both switches on.

Any other timing configuration for Ct and Rt will work OK for approximately the same timing periods, such as using a 2.2 uF. capacitor for C-7 and 2.2-M resistors for R-7, 8, and 13. If you use a 1-uF value for C-7, then use 4.7-M resistors for R-7, 8, and 13. Make sure you observe polarity markings for tantalum capacitors!

Some radios, such as the ICOM HTs, have the mike audio and PTT lines combined so that keying the microphone actually connects the mike cartridge and keys the transmitter. If you are using such a radio, connect the edge connector pin 12 (repeat audio out) to the mike/PTT common input, and install R-11 on the PCB. This resistor couples the PTT transistor, Q-5, to the transmit audio line, and pulls the audio line low enough to key the transmitter but not so low as to distort or significantly decrease the audio level to the transmitter. A 10k resistor works well for most ICOM portables, but for some others I had to use different values down to 3.3k.

The PTT transistor, Q-5, goes low (to ground) to key the transmitter. A small value transistor that will handle 100 mA, such as a 2N2222 or a 2N3904, is usually sufficient to key most transmitters. One of my radios is an old GE Master Pro mobile which I made into a repeater. This uses a big PTT relay, so I allowed room on the PCB for a 2N3053 transistor which will handle 750 mA, enough to activate nearly any relay. Make sure a protection diode is connected across any relay used. The value of Q-5's base resistor, R-17, may have to be changed, depending upon what transistor is used, its gain, and how much current is needed.

The current demands of the board vary considerably, depending upon what type of 555 is used, and whether or not the LM-386 is used. Even the voltage regulator itself will pull 5 mA or more in the standby mode. Using the 4001, 2-standard 555 timers, and an LM-386, the current consumption is about 23 mA at 12 volts in the standby mode without using a voltage regulator, and about 20 mA more with each LED on.

If current consumption is of great consequence, use CMOS 555 timers (C555). Using the 4001 and 2-CMOS 555s, the standby current is only 500 nanoamps (0.5 mA) at 12 volts! The LM-386 draws 5 mA at 12 volts. This is a primary consideration if using the repeater controller on its own battery, or if connected directly to an HTs self-contained battery.

### Repeater Controller PCB Connections

Connecting the Repeater Controller Board is relatively simple, but several basic understandings of "repeater lingo" is necessary:

- Carrier Operated Relay (COR). The term used when opening a squelch gate activates a relay or performs a function. Most amateur repeaters use this method for enabling the repeater's transmitter. A point in the receiver's squelch circuitry should be found that goes from a lower voltage when squelched to a higher voltage when unsquelched.

Pin 7 of the repeater controller's edge connector is to be connected to the squelch point if an open squelch goes more positive. The minimum open squelch voltage to pin 7 is approximately 2 volts DC (depending upon the transistor used at Q-1), with a maximum of 15 volts with R-1 at 10k and R-2 at 4.7k. The maximum voltage unsquelched should be below the transistor's turn-off point, approximately .5 volts or less. If a point cannot be located where the unsquelched voltage is less than .5 volts, then a voltage divider resistor, R-3, must be used. The value of this resistor must keep the unsquelched voltage less than .5 volts and at the same time maintain about 2 volts or more with the squelch open. If R-7 is used, the voltage must be measured at the point where R-7, R-1, and R-2 are connected. A resistance substitution box can be used to quickly find the correct value.

If a point is located that goes low in the unsquelched state, then connect it to pin 6 of the edge connector. It *must* be noted that this point must go to a true logic low and *not* merely an off state. Also, with the receiver squelched, the voltage at this point may have to be equal to or higher than the operating voltage of the repeater controller logic circuitry to work properly. Diode CR-1 is used to prevent any possible squelch voltage in the radio from appearing on the repeater controller board.

Capacitor C-6 can be used to initiate a slight turn on delay of the transmitter. I found that using a 2.2 to 4.7 uF tantalum capacitor works well, while using a value of R-1 according to the unsquelched voltage. A higher unsquelched voltage will require more resistance. The value of R-2 can also be altered to attain a slight delay in the turn-off of Q-1. Various values of R-1 and R-2 can be used to keep fast noise bursts from inadvertantly keying up the repeater, while at the same time keeping fluttering signal from a stuck microphone from resetting the time out timer. For critical times a diode should be used between the edge connector input and R-1.

If a delay is not desired, use a small value decoupling capacitor such as .001 for C-6. To key the transmitter by COR only, set DIP switch 1 OFF (or OPEN) and DIP switch 2 ON (or CLOSED). It makes no difference whether diodes CR-4 or CR-5 are used, as that section is programmed out via the DIP switch settings. The nominal HOT time is usually 2.5 seconds, and can be set by turning DIP switch 3 ON (or CLOSED) and 4 OFF (or OPEN), or vice-versa. For 5 seconds, turn switches 3 and 4 OFF (or OPEN), and for 1.75 seconds turn switches 3 and 4 both ON (or CLOSED).

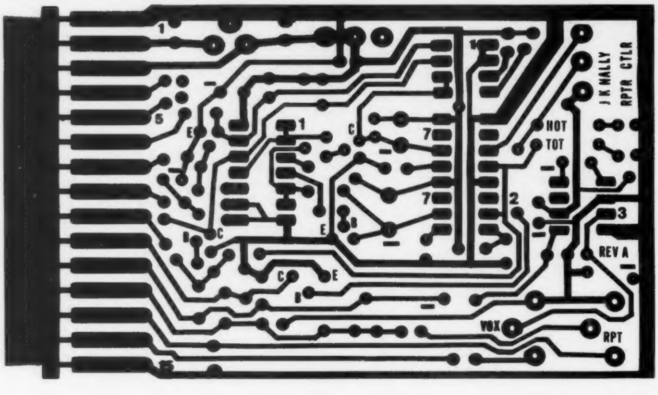

*Fig. 3. Positive of circuit board layout.*

•Voice Actuated Transmit (VOX). VOX keys the repeater's transmitter by the presence of voice coming from the receiver. A direct connection to the receiver's squelch circuitry is not necessary, unlike using the COR.

The VOX circuitry on the Repeater Controller board allows a repeater to be activated by using the unsquelched audio output of the receiver. The main disadvantage of this is that the first syllable is sometimes lost in the transmitter keyup. A longer hold-over timer, typically 5 seconds, is also necessary to prevent the loss of transmitter dropout in long pauses or low volume in the voice of the talker.

These minor disadvantages can be overlooked if a repeater is necessary in temporary or emergency conditions. Nearly any two radios of any frequency or band can be quickly connected together as a repeater with the repeater controller board, as long as one has an external speaker output and the other has an external mike and PTT input.

Connect the receiver's external audio output to pin numbers 13 (repeat audio in) and 14 (VOX audio in) of the repeater controller's edge connector. Turn the receiver's volume control to one-third to one-half open to assure uniform frequency response. Adjust the VOX pot (inside pot) so that the transmitter keys on a medium volume speaking voice and stays keyed on a medium to normal volume speaking level. Some experimentation might be necessary to attain the best adjustment without false keying.

The hold-over timer should be set to the users' talking habits, usually from about 3 to 5 seconds. For VOX applications, set DIP switch 1 to ON (or CLOSED) and DIP switch 2 to OFF (or OPEN). DIP switches 3 and 4 should be OFF (or OPEN) for a HOT time of 5 seconds. For a HOT or 2.5 seconds turn 3 ON (or CLOSED) and 4 OFF (or OPEN), or vice-versa.

•Private Line™ (PL). PL is a Motorola trademark used by hams to denote Continuously Tone Coded Squelch System (CTCSS) or "subaudible" tones. These tones, ranging from 67 to 250 Hz, are neither sub-audible nor assure a "private line". They are most often used by businesses, government agencies, and other users of shared frequencies to eliminate unwanted channel talk from adjacent users. Each business uses a different "tone", has its own subaudible encoder and decoder within each radio, and transmits the "tone" continuously when the transmitter is on.

The CTCSS is used in all UHF business repeaters which allows even a dozen businesses to share a common repeater. Since each business has a different "tone", an individual user hears only units of his business except when monitoring the channel. Monitoring the channel is usually accomplished by ungrounding the button on the back of the microphone or by a switch on the radio front panel or control head.

The Repeater Controller board is designed to use the logic output from a CTCSS decoder and enable the repeater transmitter to be turned on. When using CTCSS in a repeater system, the COR circuitry must also be used to detect a carrier. Together they assure a high degree of immunity from noise and unwanted signals from keying the transmitter.

Pin numbers 8 and 9 on the edge connector are used for the CTCSS logic interfacing. If a detected CTCSS causes the decoder output to go high, connect it to edge connector pin 9. This input will accept from 0 to .5 volts as a logic low and 2 to 15 volts for a logic high. If a detected CTCSS tone causes the decoder output to go low, use pin 8. Remember that in some cases the working voltage of the Repeater Controller board may have to be equal to or less than the undecoded quiescent state of the CTCSS decoder output. Diode CR-2 is used to protect the Repeater Controller board from any possible higher voltages present in the CTCSS decoder circuitry.

When using CTCSS, DIP switches 1 (COR Enable) and 2 (PL/VOX/Burst Enable) must both be OFF (or OPEN). Also, diodes CR-4 and CR-5 must be removed from the Repeater Controller board.

Although only a few amateur UHF repeaters utilize CTCSS, and even fewer on VHF use it, most commercial ham equipment manufacturers are incorporating programmable CTCSS encoders as standard features in their newer radios. With the growing numbers of UHF repeaters appearing on a limited number of frequencies, the expanded use of CTCSS decoders in amateur UHF repeaters will no doubt become more prevalent.

•Tone Burst. This is a simple method for enabling a repeater, either after it has not been used for a certain time, or to "revive" it after it has been turned off. Any type of tone or tones can be used, as long as they can be decoded into a logic condition. Most often used are "audible" single tones ranging from 750 to 2500 Hz., or a DTMF digit or digits.

To incorporate the use of tone burst to enable a repeater with the Repeater Controller board, the COR circuitry must first be used. The logic output from the burst decoder must be connected to either pin 9 (logic high when decoded) or pin 8 (logic low when de-

*Continued on page 41*

**Interconnection Notes**

1. If VOX is used to key the transmitter, connect receive audio to both pins 13 (rpt audio in) and 14 (LM-386 input/VOX driver).
2. If the radio's receiver speaker output is used for repeat transmitter audio, then some type of load must be used. If the internal radio speaker is disconnected, then use either an external speaker or a 10-Ohm resistor (R-5) on the PC board.
3. If using VOX, the LM-386 output MUST either be terminated with a 10-Ohm resistor on the PC board (R-4) or an external speaker.
4. The voltage regulator, MC-7812, is necessary only when using the VOX or if the input voltage is more than 14 volts. It can also be omitted if using VOX and a regulated voltage from 10–12 volts is available from an external source. The logic will work anywhere from 5 to 14 volts. The maximum working voltage for the LM-386 is 12 volts.

| HF Equipment | Regular | SALE |
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| **FL-101** 250 Hz 1st IF CW filter ..... | 69.95 | |
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| **SP-3** External speaker ............... | 61.00 | |
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| **SM-8** Desk mic - two cables, Scan..... | 78.50 | |
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**ICOM**

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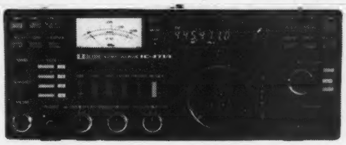

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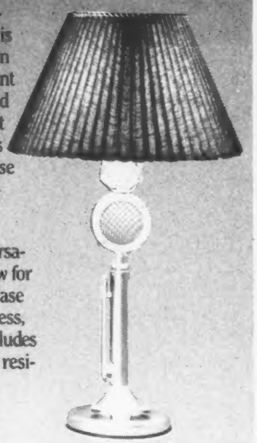

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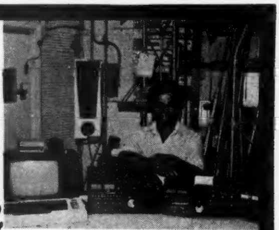

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CIRCLE 233 ON READER SERVICE CARD

coded). Use the same logic levels and connection as explained in the paragraph under "PL".

DIP switches 3 (COR ENABLE) and 4 (PL/VOX/Burst Enable) must both be in the OFF (or OPEN) position. Diode CR-5 must be used on the repeater controller board, and remove diode CR-4 (from VOX amp output).

To enable the repeater, a carrier must first be detected by the COR circuitry. A tone burst must then be detected to "start" the repeater. Once the repeater is enabled, it will stay active as long as a carrier is detected within the time envelope of the time out timer (TOT). Every time the beginning of a carrier is detected by the COR, the TOT is reset to its maximum time. Once the TOT times out, a tone burst must be used again to enable the repeater.

Although very few repeaters can be found with tone burst access, its use may reappear again with the advent of closer repeater location spacings. When mobiles of one repeater inadvertantly key up another repeater, the implementation of tone burst can help ease matters. Since most radios now have DTMF encoders, almost no one will be excluded from using the repeater. The tone burst can easily be a single DTMF digit or a "stretched" DTMF digit to enable a repeater. This can be accomplished by simply using two inexpensive NE-567 tone decoder ICs or, for about $12, a single IC DTMF decoder such as the SSI-202 can be used.

Different variations can be used to enable repeaters. For example, to eliminate repeater kerchunking, the standard COR circuit can be used, and the VOX circuitry on the Repeater Controller board added. Use diodes CR-4 and CR-5 on the board, and take the output from the repeater's receiver speaker and connect it to pin 14 of the Repeater Controller's edge connector. Any other receiver output source can also be used if it unsquelches upon the receipt of a carrier. Adjust the VOX level as explained in the paragraphs in the VOX section.

In doing this, the VOX will logically function as a "tone burst", so a detected carrier and part of the person's first syllable is necessary to enable the repeater. As long as the beginning of a carrier is detected within the TOT's time envelope, the repeater will function as a standard COR repeater. After the TOT has timed out, merely keying or kerchunking a mike is not sufficient to make the repeater transmit because some type of audio is also required.

## Using the Repeater Controller

Once the Repeater Controller board is tested, its plug-in edge connector and DIP switch programming allow great versatility. It can be used in a 100-Watt commercial repeater with PL, and one minute later be used as an emergency repeater with 2 HTs using VOX.

This particular PCB and its predecessors are being used for links, commercial and government two-way radio repeaters, and voting receiver arrays. We recently used the Repeater Controller board for the CPRA 145.47 repeater with three voting receivers. Each voting receiver keys its respective UHF link transmitter through a repeater controller PC board. A stuck mike or receiver failure at one remote voting site cannot tie up or inhibit the voter at the repeater site because of the timeout feature.

**DIP Switch Settings**

Switch ON = Closed, and Switch OFF = Open.

**DIP SW-1**

OFF: Enables pin 13 (COR) to NOR gate, so the COR input must be used for transmit. Use edge connector pin 6 if COR goes low, and edge connector pin 7 if COR goes high.

ON: Disables the COR input to the NOR gate and holds it low, allowing pin 12 (PL/Tone Burst/VOX) to initiate transmitter keying.

**DIP SW-2**

OFF: Enables pin 12 to NOR gate. The PL/Tone Burst allows TX keying when COR is activated. Use edge connector pin 7 if PL/Burst goes high, and pin 8 if PL/Burst goes low. If using Tone Burst, diode CR-5 must be used and CR-4 must be taken out. If using PL, diodes CR-4 and CR-5 must be out. For VOX only, use CR-4, take out CR-5, and do NOT use any connections to edge connector pins 7 and 8, and use LM-386 audio input to edge connector pin 14.

ON: Allows COR only to be used.

Incorporating the VOX feature was inspired by Tim Shingara WB3EYB who, as an officer in the Civil Air Patrol (CAP), needed a method to quickly set up an emergency repeater in remote areas. This had to be accomplished with existing equipment without transporting radio racks, power supplies, batteries, and a duplexer. My repeater controller board enabled them to do just that, and passed its final test in July, 1986 at a CAP ranger camp at Hawk Mountain, Pennsylvania, near Allentown.

Since the Hawk Mountain campsite is 60 miles away from the Harrisburg CAP repeater, Tim decided to set up a repeater on that frequency pair, to accommodate the Harrisburg CAP members who have both rockbound and synthesized radios on that frequency. At that distance neither repeater would interfere with each other.

A repeater was set up using 2 ICOM 02AT HTs, and placed in a jeep parked at the top of the mountain. Both radios and the repeater controller board were connected to the jeep's battery. Two separate antennas were used—the vehicle's antenna on top of the roof was connected to the radio used as a receiver. A portable ground plane antenna was set up about 20 feet away and connected to the HT being used as the transmitter.

Since the CAP repeater frequencies are far apart—148 MHz for transmit and 143 MHz for receive, virtually no desense from the antennas occurred when using 2 Watts from the transmitter. Some noise problems were encountered with both radios lying in the front seat beside each other, but this was quickly resolved by putting one radio on the back seat. Repeater performance was excellent.

The only real difficulty was educating some of the users, making them realize that this was an emergency repeater, and that their *voice* activated the transmitter, (as opposed to COR on the repeater back home). Once they grasped the concept all went fairly well, considering the 02AT takes almost a half second to lock in the VCO and transmit.

It is surprising how well VOX will work with some radios with electronic switching, where transmitter turn-on is nearly instantaneous. Only a fraction of the first syllable is lost, and with some receivers, the initial "thump" of the squelch opening is enough to key the transmitter without detecting voice. Other radios with computer controlled VCOs, however, take up to a half second for their transmitters to turn on, so try to avoid these as transmitters if possible. If they must be used, the HOT should be set to at least 5 seconds.

One of the arrangements I have made for a portable VOX repeater is simple and even somewhat crude, using my 2AT and another ham's 2AT or 02AT. I wired up a 15-pin edge connector for the board and used double-sided tape to attach a 2-inch speaker. A 10-inch shielded cable was soldered to the edge connector and a plug for transmitter audio and PTT was attached to the other end. Another shielded cable, about 25-feet long, was also soldered to the edge connector, and a plug attached for speaker audio from the other HT.

I attached the bare repeater controller board and edge connector to the "transmitter" HT with a rubber band. The ground wire from the repeater controller is attached to an alligator clip and clipped to the HT's BNC connector for ground. For the B+ wire, a small alligator clip is attached and clipped to the bottom of the HT's battery case, on the small battery charger contact screw. The small speaker taped to the edge connector puts a load on the repeater receiver's audio output. It also allows monitoring of the receiver to set proper transmitter audio levels via VR-1 and VOX threshold via VR-2.

On 2 meters, I use each radio's "rubber duck" antennas, and since there is no duplexer, vertical separation must be used to minimize receiver desense. With about 15 feet vertical separation, and using low transmitter power (about 300 mW.), very good results should be obtained if both radios are located somewhat high above the ground. For better results, higher power can be used, and an extension wire to the repeater's "receiver" radio must be used to allow better physical separation. The vertical and horizontal antenna separation, the distance between the two radios, and the amount of transmitter power used primarily determine the efficiency and range of this type of repeater.

Several rules of thumb should be observed if such a portable repeater is used:

- The Repeater Controller board should be closest to the transmitter but not directly adjacent to the antenna to avoid RF interference problems. Since audio is taken from the "receiver's" speaker output which is of a very low impedence, there is less chance of rf interference as compared to the higher transmit audio input impedence.
- Do not set the receiver's squelch at threshold—set it at least 1/8 of a full turn past threshold to compensate for battery drain and possible interference that could inadvertently key the transmitter. Since transmitter audio is taken from the speaker amp, keep the volume control at 1/3 to 1/2 open to assure linear frequency response.
- Use CMOS 555 timer ICs on the repeater controller board to minimize battery drain, and even clipping the resistors (R-19 and R-20) to the 2 LEDs will reduce drain further. A high capacity battery such as the BP-8 in both radios extends repeater life.
- The use of external antennas always works better, but vertical and horizontal separation may have to be increased. An excellent compromise is using quarter wave antennas on top of the HTs instead of rubber ducks. Vertical separation between antennas considerably out-performs horizontal separation when comparing performance versus actual distance between them.
- If using VOX, keep in mind that the operating voltage of the LM-386 determines its maximum audio output, and therefore determines the turn on of transistor Q-2. If battery power is being used, allow sufficient threshold to compensate for lower battery voltage by turning up VR-2 to more than its turn-on point.
- A UHF repeater of this type also performs well, and the same cables and connectors can be used if the same manufacturer's radios are being used. Since the frequency spacing between receive and transmit is relatively larger than on 2 meters, receiver desense may be less of a problem.
- Since, in all practicalities, an IDer can't be used in such a portable configuration, don't forget to ID the repeater.

A low-cost portable repeater can be constructed in a small plastic or metal carrying case. Although a metal one is ideal, a plastic one can be used if the HTs are mounted on a metal plate, with grounding braid attached to the HT's antenna connector for a good common rf ground. Each radio should be covered in its own metal housing such as an aluminum chassis for rf isolation. Keep all wires as short as possible, and use shielded wire for the power supply and repeater controller PCB connections.

An even better "portable" repeater configuration can be set up by connecting two separate vehicle-mounted mobile rigs together. The same rules should apply, but better performance can be expected because of better selectivity in mobile radio receivers, an excellent ground plane for vehicle-mounted antennas, and higher transmitter power. If sufficient distance between the cars cannot be achieved and receiver desense occurs, then transmitter power should be lowered.

Since a mobile radio has room for accessory interfacing, a connection to the squelch circuitry for COR can be located and tied into an accessory jack. This can be used to activate the transmitter rather than VOX, and make it sound much like a commercial repeater.

Keeping a spare repeater controller board in the shack can be a lifesaver if the club's repeater logic dies. In the meantime, it can be used for links, other emergency uses, and even for setting up a portable repeater to link home area hams visiting a distant hamfest.

### PARTS LIST FOR THE REPEATER CONTROLLER BOARD

**Resistors**

| Quantity | Description | Where Used |
|---|---|---|
| 2 | 10 Ohm, 1/4 Watt | R-5,6 |
| 2 | 1k, 1/4 Watt | R-19,20 |
| 1 | 2.2k, 1/4 Watt | R-17 |
| 1 | 4.7k, 1/4 Watt | R-2 |
| 8 | 10 k, 1/4 Watt | R-1,4,7,8,11,15,18,21 |
| 1 | 220k, 1/4 Watt | R-14 |
| 3 | 1 Meg, 1/4 Watt | R-9,10,13 |
| 1 | 4.7 Meg, 1/4 Watt | R-16 |
| 3 | Select values, if used | R-3 = COR Voltage Divider<br>R-11 = TX Key on audio line<br>R-12 = TX audio low pass filter |

**Variable Resistors**

| | |
|---|---|
| VR-1, VR-2 | 10k, PC Mount |

**Capacitors**

Except where noted, all capacitors are ceramic monolithic, in microfarads, and rated 16 volts or more.

| Quantity | Description | Where Used |
|---|---|---|
| 3 | .001 ceramic monolithic or disk | C-2,15,18 |
| 5 | .01 ceramic monolithic | C-4,8,9,14 |
| 3 | .1 ceramic monolithic | C-1,11,13,16 |
| 1 | 2.2 tantalum | C-19 |
| 1 | 4.7 tantalum | C-7 |
| 2 | 22 electrolytic | C-3,5 |
| 1 | 22 tantalum | C-10 |
| 1 | 100 electrolytic | C-17 |
| 3 | select values, if used (see text) | C-6 COR delay<br>C-12 Low pass filter<br>C-20 LM-386 gain |

**Transistors**

| | |
|---|---|
| Q-1 to Q-4 | 2N2222 or 2N3904 |
| Q-5 | 2N2222 or 2N2904 transmitter keyup, 100 mA or less, 2N3053 for 100 mA to 750 mA |

**Diodes**

| | |
|---|---|
| CR-1 to CR-5 | 1N4148 or equivalent |

**Integrated Circuits**

| | |
|---|---|
| IC-1 | 4001 Quad NOR gate |
| IC-2 | 555 timer (or C555 CMOS Version) |
| IC-3 | 555 timer (or C555 CMOS Version) |
| IC-4 | LM-386 400-mW audio amp |
| Voltage Regulator | MC-7805 to MC-7812, if needed (see text) |

**Switches**

| | |
|---|---|
| SW-1 | SPST, miniature, toggle (Power On), PC mount, optional |
| SW-2 | SPDT, with middle position off, miniature, toggle (PTT/OFF/TEST Tx)<br>PC mount, vertical mount or 90-degree mount |
| DIP SW | DIP Switch, PC-mount, 4-Position |

**Miscellaneous Hardware**

2 Miniature LEDs, PC Board, Edge Connector, IC sockets if desired.

A commercially manufactured, drilled and plated PC Board can be ordered from KA3AAQ, John K. Nally, 2934 Banks St. Harrisburg PA 17103, for $ 8.00 each, including shipping.

**ASTRON CORPORATION**

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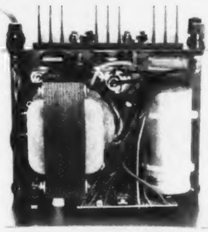

INSIDE VIEW — RS-12A

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- INPUT VOLTAGE: 105-125 VAC
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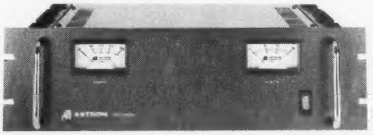
- RIPPLE Less than 5mv peak to peak (full load & low line)
- **Also available with 220 VAC input voltage**

MODEL RS-50A

MODEL RS-50M

MODEL VS-50M

## RM SERIES



MODEL RM-35M

## 19" × 5¼ RACK MOUNT POWER SUPPLIES

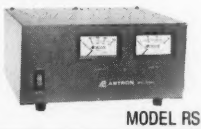
| MODEL | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| RM-12A | 9 | 12 | 5¼ × 19 × 8¼ | 16 |
| RM-35A | 25 | 35 | 5¼ × 19 × 12½ | 38 |
| RM-50A | 37 | 50 | 5¼ × 19 × 12½ | 50 |
| • Separate Volt and Amp Meters | | | | |
| RM-12M | 9 | 12 | 5¼ × 19 × 8¼ | 16 |
| RM-35M | 25 | 35 | 5¼ × 19 × 12½ | 38 |
| RM-50M | 37 | 50 | 5¼ × 19 × 12½ | 50 |

## RS-A SERIES

MODEL RS-7A

| MODEL | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| RS-3A | 2.5 | 3 | 3 × 4¾ × 5¾ | 4 |
| RS-4A | 3 | 4 | 3¾ × 6½ × 9 | 5 |
| RS-5A | 4 | 5 | 3½ × 6⅛ × 7¼ | 7 |
| RS-7A | 5 | 7 | 3¾ × 6½ × 9 | 9 |
| RS-7B | 5 | 7 | 4 × 7½ × 10¾ | 10 |
| RS-10A | 7.5 | 10 | 4 × 7½ × 10¾ | 11 |
| RS-12A | 9 | 12 | 4½ × 8 × 9 | 13 |
| RS-12B | 9 | 12 | 4 × 7½ × 10¾ | 13 |
| RS-20A | 16 | 20 | 5 × 9 × 10½ | 18 |
| RS-35A | 25 | 35 | 5 × 11 × 11 | 27 |
| RS-50A | 37 | 50 | 6 × 13¾ × 11 | 46 |

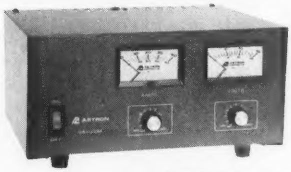
## RS-M SERIES



MODEL RS-35M

| MODEL | Continuous Duty (Amps) | ICS* (Amps) | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| • Switchable volt and Amp meter | | | | |
| RS-12M | 9 | 12 | 4½ × 8 × 9 | 13 |
| • Separate volt and Amp meters | | | | |
| RS-20M | 16 | 20 | 5 × 9 × 10½ | 18 |
| RS-35M | 25 | 35 | 5 × 11 × 11 | 27 |
| RS-50M | 37 | 50 | 6 × 13¾ × 11 | 46 |

## VS-M AND VRM-M SERIES



MODEL VS-35M

- Separate Volt and Amp Meters • Output Voltage adjustable from 2-15 volts • Current limit adjustable from 1.5 amps to Full Load

| MODEL | Continuous Duty (Amps) @13.8VDC | @10VDC | @5VDC | ICS* (Amps) @13.8V | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|---|---|
| VS-12M | 9 | 5 | 2 | 12 | 4½ × 8 × 9 | 13 |
| VS-20M | 16 | 9 | 4 | 20 | 5 × 9 × 10½ | 20 |
| VS-35M | 25 | 15 | 7 | 35 | 5 × 11 × 11 | 29 |
| VS-50M | 37 | 22 | 10 | 50 | 6 × 13¾ × 11 | 46 |
| • Variable rack mount power supplies | | | | | | |
| VRM-35M | 25 | 15 | 7 | 35 | 5¼ × 19 × 12½ | 38 |
| VRM-50M | 37 | 22 | 10 | 50 | 5¼ × 19 × 12½ | 50 |

## RS-S SERIES

MODEL RS-12S

- Built in speaker

| MODEL | Continuous Duty (Amps) | ICS* Amps | Size (IN) H × W × D | Shipping Wt. (lbs.) |
|---|---|---|---|---|
| RS-7S | 5 | 7 | 4 × 7½ × 10¾ | 10 |
| RS-10S | 7.5 | 10 | 4 × 7½ × 10¾ | 12 |
| RS-12S | 9 | 12 | 4½ × 8 × 9 | 13 |
| RS-20S | 16 | 20 | 5 × 9 × 10½ | 18 |

*ICS—Intermittent Communication Service (50% Duty Cycle 5min. on 5 min. off)

CIRCLE 16 ON READER SERVICE CARD

*Paul M. Danzer N1II*
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*Norwalk CT 06851*

# Let the Computer Steer Your Beam

## *Interface your standard five-wire connected rotor with your VIC-20 computer.*

Ham radio and computers seem to go together. If you ask most hams how they use their computer, they tell you they have software that will figure out almost any circuit calculation with Ohm's Law, and probably how they can run RTTY and AMTOR or Packet. Finally, they will say that someday—*someday* when they get around to it—they are going to tie their entire station together and run it through the computer.

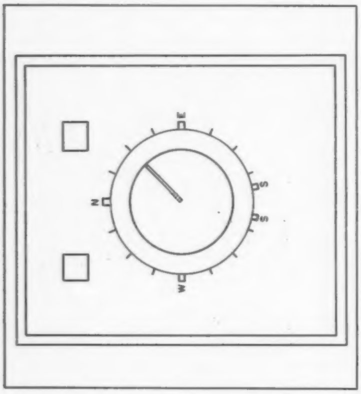

*Fig. 1. Diagram of the rotor face.*

Well, someday arrived here at N1II. I just couldn't stand having my little VIC-20 sitting around doing nothing most of the time. I decided to put it to work, and direct control of my triband antenna rotor was the result.

### Start With an Analog Rotor

Like many other hams, I never bought a deluxe rotor. For many years, I used several identical models of an old standby, a five-wire connected rotor which I believe was first produced by RCA with a model number 10W707, with a selling price of $29.95. Later, Radio Shack sold it under several numbers, including 15-1220, at prices ranging from $39.95 to $60. I am told that Alliance sold similar models. In addition to the use of a 5-conductor cable, it can be recognized by a control unit that looks slightly like a rectangular pyramid with the top cut off, and a face similar to that in Figure 1. In addition to the manufacturer's logo, there is a single potentiometer control, and two small rectangular lights that go on to indicate the direction of rotation.

Although I selected this particular unit, the modifications can be applied to several other types of rotors controlled by a potentiometer geared to the motor, as well as a differential amplifier in the control head.

Since several hundred thousand of these little beauties were sold, the manufacturer must have had a pretty good design—and he did. The basic circuit is shown in Figure 2. When you turn the control pot $R_C$ on the front panel the bridge circuit is unbalanced. The differential amplifier senses the imbalance and feeds back to drive the motor. Geared to

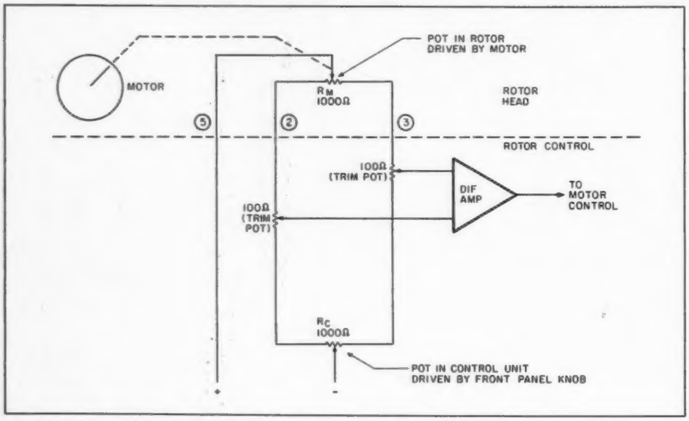
MOTOR
POT IN ROTOR DRIVEN BY MOTOR
$R_M$ 1000Ω
ROTOR HEAD
⑤
②
③
ROTOR CONTROL
100Ω (TRIM POT)
100Ω (TRIM POT)
DIF AMP
TO MOTOR CONTROL
$R_C$ 1000Ω
POT IN CONTROL UNIT DRIVEN BY FRONT PANEL KNOB
+
-

*Fig. 2. Basic circuit of the five-wire connected rotor.*

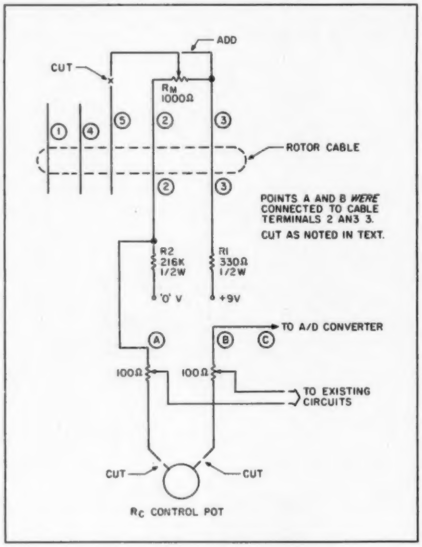
ADD
CUT
$R_M$ 1000Ω
①
④
⑤
②
③
ROTOR CABLE
②
③
POINTS A AND B *WERE* CONNECTED TO CABLE TERMINALS 2 AN3 3.
CUT AS NOTED IN TEXT.
R2 216K 1/2W
R1 330Ω 1/2W
'0' V
+9V
TO A/D CONVERTER
Ⓐ
Ⓑ
Ⓒ
100Ω
100Ω
TO EXISTING CIRCUITS
CUT
CUT
$R_C$ CONTROL POT

*Fig. 3. The new bridge circuit.*

# LETTERS

*Continued from page 9*

yet, I have had my Spanish language QSOs interrupted by irate countrymen of mine who tried to insist that either I speak English or get off the air.

But you should know that nothing will change because the great majority of traffic handlers don't want things to change, and they are letting their directors know about it in no uncertain terms.

Before closing, I also wish to say that in emergencies close to home our repeaters seem to do a pretty good job. The fellows who keep those machines going, often through great expense and a lot of hard work, are to be congratulated. They have saved our reputation.

**Fred Laun K3ZO**
**Nicaragua!**

## CUT WHAT?

If we are lamenting the loss of the electronics gold mine to the Japanese, we did that to ourselves. Back in 1963, I was employed by Univac and I recall management showing courteous Japanese businessmen our assembly line techniques. We had to "cut costs." I think the only thing we cut was our throats.

**Ben Alabastro WA2PXR**
**Frankfort NY**

## NO PROBLEM

Wayne's September editorial comments that resident Novice expert, Bill Welsh W6DDB, says he hasn't seen anything to be happy about, so far, about Novice licensing figures. Yet, in this same issue, your page 8 Novice statistics indicate a sizeable increase in new license applications. I agree with this finding—our college classes are packed to the hilt this fall with the young and old wanting to get their beginner amateur radio Novice voice-class ticket. Our weekend classes have also been a sellout, and we have more students than our college classes can hold.

I believe Mr. Welsh may not be seeing the number of new candidates because he has not revised his outlook, nor his curriculum, to the new style amateur radio service. It's absolutely true that the newcomer is an appliance operator. It's also true that our new students couldn't begin to create any type of antenna system out of wires around an oatmeal container. However, the new breed of students will know all about packet, voice privileges on repeater bands, and will have good training on how to go on the air properly with their new privileges.

Our classroom sessions dazzle students with laser lights to illustrate propagation, containers of water to describe electromotive force, charged capacitors showing the effects of short circuits, and many demonstrations of equipment actually on the air. It's a whole new teaching game, and if we recognize that most students want to become communicators rather than electrical engineers, the process works fine.

Those organizations or individuals that don't see anything happening with Novice enhancement simply have a preconceived bad attitude about the whole idea. Let's not spoil it for the rest of us that are finding more students than we can teach, and more enthusiasm than we have seen in many years. Yes, the numbers are there!

**Gordon West WB6NOA**
**Instructor,**
**Coastline Community College**
**Costa Mesa CA 92626**

*Continued on page 64*

## ENDS & ODDS

Ooops! October's Alden Weatherfax review ended on page 82—we neglected to mention that on page 19.

Moving! Bilal's Isotron Antennas for HF have moved to 137 Manchester Drive, Florissant CO 80816 (303/687-0650).

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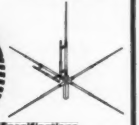
Specifications
Gain: 4.75 DB
Multiplication Factor: 12 Times
Power Rating: 2000 CW, 4000 PEP
Height: 10 Feet
Weight: 8.0 Lbs.
Materials: Anodized 6063T-6 Aircraft Aluminum Tubing
Requires 1 Coaxial Cable for Hook-up

JO GUNN Antennas

JGAR – HILLBILLY



Specifications
Gain: Horizontal - 5.25 DB, Vertical - 4.75 DB
Multiplication Factors: Horizontal - 17 Times, Vertical - 15 Times
Horz. to Vert. Separation: 20-25 DB
Power Rating: 2000 CW, 4000 PEP
Height: 11 Feet
Weight: 10 Lbs.
Materials: Anodized 6063T-6 Aircraft Aluminum Tubing
Requires 2 Separate Coaxial Cables for Hook-up
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the motor is a second pot, $R_M$, and when the motor drives the pot to balance the bridge (and, incidentally, turn the antenna), the balance condition turns off the differential amplifier.

Note the terminal numbers 5, 2, and 3, shown in the figure. If terminal 5 wasn't also used for a motor voltage, you wouldn't have to touch the rotor at all, and all of the modification would be in the control head. However, as you will see shortly, a slight modification has to be made in the rotor.

### New Bridge Circuit

The new bridge circuit is shown in Figure 3. After modification, +9 volts is sent through R1 and wire 3 to the pot, and the other end of the pot goes to R2 and then to zero volts. We are not using the term "ground" since this "zero" point is tied to the computer ground.

If you trace the printed circuit wiring in the rotor control head, you see that terminal 2 goes through a small 100-Ohm trimpot to one side of the original control pot, $R_C$. Cut the PC wiring from both ends of the control pot either with a small sharp knife or with a rotary grinding tool. The center of the trimpot is already connected to one side of the differential amplifier.

One end of the second trimpot goes to terminal 3, and the other end to the control pot $R_C$. Cut the printed wiring both at terminal 3 and at $R_C$, so that the trimpot now acts as a convenient connection point. It will later be wired to the digital-to-analog (D/A) converter (Figure 3).The voltage at terminal 2 now varies with the position of $R_M$, and is compared with the D/A output.

Fortunately, the rotor modification can be made without major disassembly of the rotor. The connecting terminal board on the rotor is held on by a single nut (Figure 4). When you remove the nut, the board drops out, and behind is the wiring to pot $R_M$.

There are two wires connected to the center terminal of the pot—remove them, solder them together, and tape the connection (Figure 5). Now add the jumper between the center of $R_M$ and one end—don't waste time trying to figure out which end is which, since it doesn't make any difference. Replace the terminal board and its retaining nut, and you're finished with the rotor modifications.

The circuit I used is shown in Figure 6. It is a very simple A/D converter, built on a Radio Shack 176-170 experimenter's breadboard. There is not much precision involved, since you can recalibrate the system in the computer program. IC1 is the actual A/D converter and it is connected to the computer. IC2 is an amplifier with R6 used to set the low voltage limit (all "0"s from the computer), and R6 the gain so that all "1"s from the computer produces the voltage swing needed by the differential amplifier in the rotor control head.

The output of the circuit is connected back to point C in Figure 3. While I chose to build my own A/D, there are several low- cost microcircuits on the market which I could have used. However, I rarely have the patience to wait for long-distance parts and therefore usually use only items locally available. If you're a more patient type, you might look at the Signetics MC3410, listed for $9; or the ADC0803, 0804, or 0805 that start at $5.

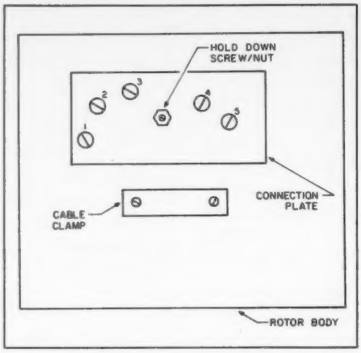


*Fig. 4. The connecting rotor terminal board.*

### Computer Connections

Since there is a VIC-20 in my ham shack, I connected to it by way of the "user port." I'm told that the Commodore 64-series computers use this same port with the same modem as the VIC-20, so what follows should also hold for the C-64 series. If you own another computer there are several alternatives discussed later.

Figure 7 shows how to connect the A/D to the VIC-20 user port. Again, on the basis of "use what you can get," I took a Radio Shack 276-1551 connector and cut it down from 44 pins to 24 pins with a few strokes of a hacksaw.

Put this connector face down on the bench and count to the thirteenth pair of pins from the left. Then, just to the right of this thirteenth pair of pins cut through the connector. Pull out the thirteenth pair with needle-nose pliers and you now have a perfectly usable 24-pin connector.

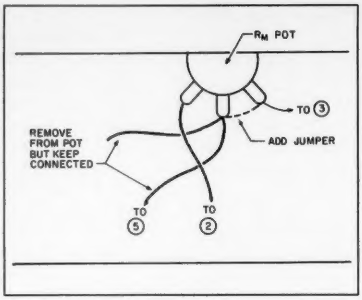
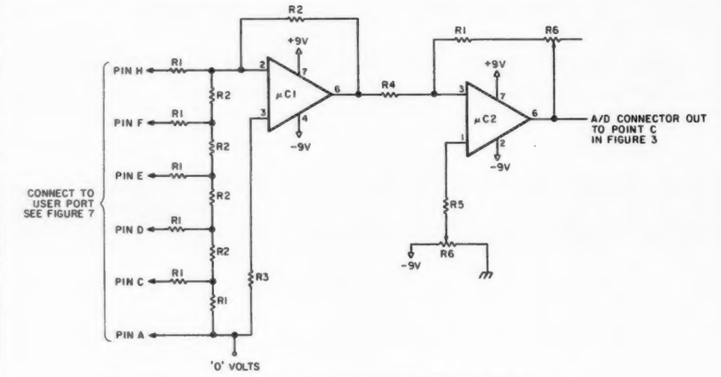


*Fig. 5. Rotor modification.*

Pin wiring is shown in Figure 7, with the connections of pins A, C, D, E, F, H as shown to the resistors in Figure 6. Note that the omission of G is not a mistake. Notice also that pins M and N are used. These go through the little circuit in Figure 8 to the rotor control head. The best reference for this operation is a book called "VIC-20 Programmers' Reference Guide", sold by Commodore.

If you look at the top of the printed wiring board in the rotor control head, you see an insulated arm connected to the shaft of the control pot, $R_C$. When you turn the pot, this arm momentarily presses together the center and outside of a "U"-shaped assembly, that in turn applies 120 volts (line voltage) to the rotor control circuit. After this initial kick a relay closes, which keeps the 120 volts present until the bridge is balanced.

Since we are not going to mechanically rotate $R_C$, the circuit of Figure 8 substitutes for the mechanical closure of the contacts. The output of relay, RY1 is connected to the center and outside of the "U"-shaped contacts—be careful here, since you are now fooling with 120 volts. I built the circuit on a leftover piece of perf board, about 2 inches by 3 inches. I used a hot glue gun to melt glue


R2
+9V
R1
R6
PIN H
PIN F
PIN E
PIN D
PIN C
PIN A
R1
R2
R3
R4
R5
µC1
µC2
-9V
CONNECT TO USER PORT SEE FIGURE 7
A/D CONNECTOR OUT TO POINT C IN FIGURE 3
'0' VOLTS

R1 = 2K, 1/2W
R2 = 1K, 1/2W
R3 = 470Ω, 1/2W
R4 = 10K, 1/2W
R5 = 4.7K, 1/2W
R6 = 10K POT
RADIO SHACK No.271-1715

µC1, µC2 - 741 RADIO SHACK No.276-007

SOCKETS - RADIO SHACK No.276-1995

BUILT ON EXPERIMENTERS PC BOARD RADIO SHACK No. 276-170

*Fig. 6. Schematic for connecting the D/A to the VIC-20 user port.*

MIRAGE /KLM

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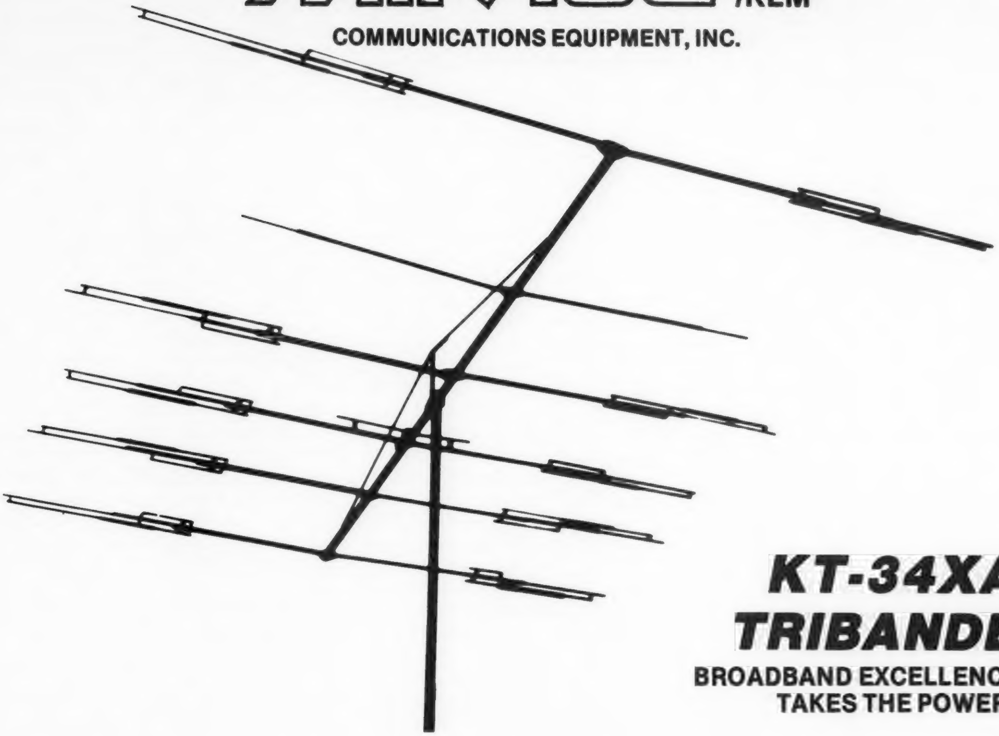

# KT-34XA TRIBANDER

## BROADBAND EXCELLENCE THAT TAKES THE POWER

KLM's KT-34XA TRIBANDER is the 2nd generation of a unique new series of antennas designed to provide superior **broadband** coverage on 20, 15, and 10 meters. The combination of lossless linear loading and hi-Q air capacitors enables the KT-34XA to outperform **all** commercial available tribanders and meet or exceed the performance of a conventional stacked monoband system. The lower weight and windload of a single antenna mean reduced tower and rotator requirements. Thus, overall system costs can be kept to a minimum while enjoying the best of monobander-type performance.

KLM's field proven KT-34A is the heart of the "XA" model. The boom length of the "XA", however, has been doubled, and one triresonant and one full size 10 meter element have been added. These changes increase the gain to **11-11.3 dBd** on 10M, **9-9.5 dBd** on 15M, and **8.5-9 dBd** on 20M. Two driven elements are used to make the KT-34XA unusually broadbanded (a concept applied to many KLM antennas). Gain is virtually flat across each band except for 10 meters which has been optimized for the DX'er, 28-29 MHz. The chart shows the remarkable performance qualities of the KT-34XA.

The KT-34XA's design represents the first major advancement in tribander technology in over 20 years! The conventional traps, coils, and capacitors have been discarded in favor of integral linear loading and hi-Q air capacitors, all composed of aluminum tubing. These give the KT-34XA a conservative power handling capability of 4 KW PEP and an unusually high level of operating **efficiency**. Linear loading also makes full ¼-wave elements possible on 15 and 10 meters, and brings 20 meters much closer to the desirable ¼-wave than any conventional tribander.

| | | | |
|---|---|---|---|
| **BANDWIDTHS:** | 14.0-14.350 MHz<br>21.0-21.50 MHz<br>28-29 MHz | **GAIN:** | 8.5-9dB<br>9-9.5dB<br>11-11.3dB |
| **VSWR:** | 1.5:1 | **BOOM LENGTH:** | 32 ft.×3"O.D. |
| **FB/FS:** | 20dB/40dB | **TURN RADIUS:** | 21.5 ft. |
| **FEED IMP.:** | 50 ohms w/balun | **WINDLOAD:** | 9 sq. ft. |
| **BALUN:** | 3-60-4:1 5KW PEP | **WT. (LBS.):** | 75 lbs. |
| **ELEMENT LENGTH:** | 24 ft. | **MAST:** | 2" O.D. (standard) |

Mechanically, the KT-34XA has been built to survive the toughest weather conditions. All aluminum, including the boom, is strong 6063-T832 alloy. All electrical hardware is stainless steel. Virtually indestructible "Lexan" insulators, just like those on KLM's 40 meter "Big Sticker," are used for mounting the elements and insulating them from the boom. KLM's 3-60 MHz 4:1 balun is supplied for direct connection to any 50 ohm feedline.

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over the bottom relay wires and the wires connecting to the contacts in the rotor, so that when I forgot myself—and picked up the energized circuit—the glue kept me from any shock. Again, the components here are not critical. Almost any decent NPN transistor will do, and if you cannot obtain a 9-volt relay such as the Radio Shack unit shown, use a 5-volt unit with a series resistor.

### Construction

The A/D converter was built on a experimenter's breadboard and the switching circuit on a piece of perfboard. Connection to the computer is by way of a spare piece of ribbon cable since no critical signal timing is involved—just dc voltages.

Power was supplied by a pair of 9-volt supplies—in fact, batteries work fine for a short time. Notice that ground is never used. Both batteries or power supplies connect to the point labeled "0" volts, and this point is tied to the computer ground through the connecting cable.

The easiest way to calibrate the system is in pieces. Don't connect the computer and disconnect the A/D converter from Point C (Figure 3). Set up a variable voltage source with either an adjustable power supply or a 9-volt battery and a 1000-Ohm pot, to allow you to place a variable dc voltage on Point C, positive to C, and negative to the "0"-volt point.

Set the voltage to 0, plug the rotor control head into the ac line, and carefully momentarily short the "U" contacts (Figure 8) with an insulated jumper. The rotor will begin to turn and continue turning after you have removed the jumper. Finally, it will stop at one end. Now, adjust the voltage at point C until the front panel light goes out. This defines one end point, that we will call "true north." Measure and record this "true north" voltage.

Increase the voltage to 9 volts and again use the insulated jumper for a second or two. Again, when the rotor stops adjust the voltage on C until the light (this time it will be the other light) goes out. This is "wrong north." Measure and record the voltage.

Take the A/D converter, tie the input pins (C, D, E, F, and H) to "0" volts, apply power to it, and adjust R5 and R6 until the output of the converter reads the same as that measured for "true north." Next, connect the input pins to +4.5 volts (it does not have to be exact) and adjust R5 and R6 to the voltage of "wrong north." Repeat these two steps until you produce both voltages. Finally, hook the A/D converter to the computer, load in the program, and retrim the circuit by entering 0 degrees and 360 degrees alternately at the keyboard. You will probably have to trim it up again when you connect to the rotor control unit. Figure 9 illustrates these steps.

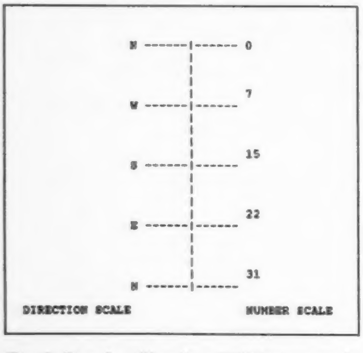


*Fig. 9. Rough calibration. "0" is true north.*

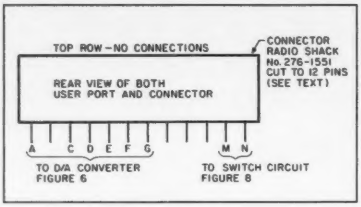
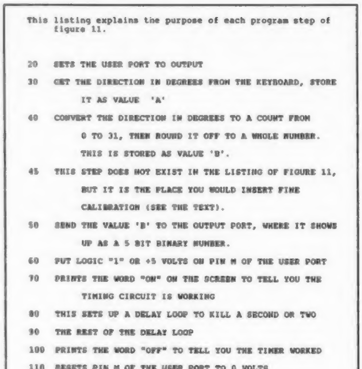

TOP ROW - NO CONNECTIONS
CONNECTOR RADIO SHACK No. 276-1551 CUT TO 12 PINS (SEE TEXT)
REAR VIEW OF BOTH USER PORT AND CONNECTOR
A
C
D
E
F
G
M
N
TO D/A CONVERTER FIGURE 6
TO SWITCH CIRCUIT FIGURE 8

*Fig. 7. Pin wiring.*

The system is set up to use 5 inputs, or a 5-bit binary word. In binary this ranges from all zeros (true north) to all 1s or a count of 31 (the wrong north). From the number scale 0 is set to north, near 7 is west, near 15 is south, and so on. The divisions are not exact and the ideal would be to set the "all ones" or 31 to be a rotation just short of "wrong south."

Incidentally, if this sounds confusing—or if you feel that you have been going around in circles—compare the rotor panel in Figure 1 with the scale in Figure 9. The manufacturer sets up the system to swing from south *through north* and back to south. He also supplies little paste-on labels so if you want to mount the rotor 180 degrees rotated, as I usually do, then the rotor will swing from north *through south* and back to north. Since I've found this much more convenient I set this computer system up this way—you can change it if you prefer.

Figure 10 explains the short program needed for the VIC-20, and the program in BASIC, is given in Figure 11. Step 45 is the point to insert fine calibration. Depending on how accurate you want to be, you might want to write a short program which fixes any errors in the A/D converter, although with a beam that has a 15 or 20 degree beamwidth, it hardly seems to pay. On the other hand, if you have a lot of patience, you might eliminate steps 20 through 45 and substitute a table look-up of country prefix vs. direction. Anyone with the patience to do this, please send me a copy.



```
This listing explains the purpose of each program step of
     figure 11.


20   SETS THE USER PORT TO OUTPUT
30   GET THE DIRECTION IN DEGREES FROM THE KEYBOARD, STORE
          IT AS VALUE  'A'
40   CONVERT THE DIRECTION IN DEGREES TO A COUNT FROM
          0 TO 31, THEN ROUND IT OFF TO A WHOLE NUMBER.
          THIS IS STORED AS VALUE 'B'.
45   THIS STEP DOES NOT EXIST IN THE LISTING OF FIGURE 11,
          BUT IT IS THE PLACE YOU WOULD INSERT FINE
          CALIBRATION (SEE THE TEXT).
50   SEND THE VALUE 'B' TO THE OUTPUT PORT, WHERE IT SHOWS
          UP AS A 5 BIT BINARY NUMBER.
60   PUT LOGIC "1" OR +5 VOLTS ON PIN M OF THE USER PORT
70   PRINTS THE WORD "ON" ON THE SCREEN TO TELL YOU THE
          TIMING CIRCUIT IS WORKING
80   THIS SETS UP A DELAY LOOP TO KILL A SECOND OR TWO
90   THE REST OF THE DELAY LOOP
100  PRINTS THE WORD "OFF" TO TELL YOU THE TIMER WORKED
110  RESETS PIN M OF THE USER PORT TO 0 VOLTS
120  SENDS YOU BACK TO STEP 30 TO GET ANOTHER INPUT
          IF YOU WANT TO CHANGE THE DIRECTION
```

*Fig. 10. Program flow, in BASIC, for the VIC-20.*

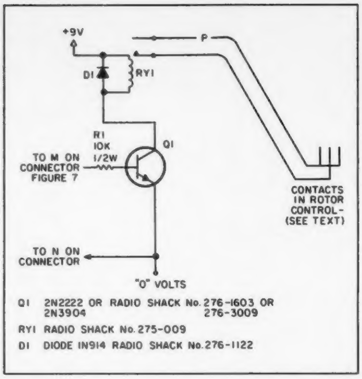
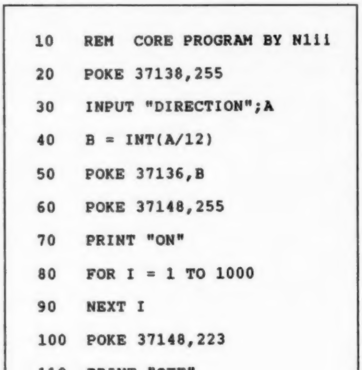

+9V
P
D1
RY1
R1
10K
1/2W
Q1
TO M ON CONNECTOR FIGURE 7
CONTACTS IN ROTOR CONTROL-(SEE TEXT)
TO N ON CONNECTOR
"0" VOLTS
Q1 2N2222 OR RADIO SHACK No. 276-1603 OR 2N3904 276-3009
RY1 RADIO SHACK No. 275-009
D1 DIODE IN914 RADIO SHACK No. 276-1122

*Fig. 8. Relay circuit to maintain current to rotate the rotor until the bridge circuit is balanced.*

Although I used a VIC-20 and its output port for the computer, the idea could be adapted to other computers. The Apple game port has four outputs, and by using it in two banks, the same effect could be obtained. Alternately, an AY-3-1015D UART chip could be set up to accept RS-232 from any computer's serial port, and the parallel output of the chip used for 5 bits of data and one bit for control of the rotor 120-volt contacts.

Other rotors can also be used—the basic requirement is the ability to get into a pot on the rotor and the differential amplifier on the rotor control head.

Give it a try, and good luck. ■



```
10   REM  CORE PROGRAM BY N1ii
20   POKE 37138,255
30   INPUT "DIRECTION";A
40   B = INT(A/12)
50   POKE 37136,B
60   POKE 37148,255
70   PRINT "ON"
80   FOR I = 1 TO 1000
90   NEXT I
100  POKE 37148,223
110  PRINT "OFF"
120  RUN 30
```

*Fig. 11. The program listing for Figure 10.*

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The PK-232 also includes a no compromise VHF/HF/CW modem with an eight pole bandpass filter, four pole discriminator, and 5 pole post detection low pass filter. Experienced HF Packeteers are reporting the PK-232 to have the best Packet modem available.

Operation of the PK-232 is a breeze, with twenty-one front panel indicators for constant status and mode indication. The 240 page manual includes a "quick start" section for easy connection and complete documentation including schematics. Two identical back panel radio ports mean either your VHF or HF radio can be selected with a front panel switch. Other back panel connections include external modem disconnect, FSK and Scope Outputs, CW keying jacks, and RS-232 terminal interface.

The RS-232 connector is also used for attaching any Epson graphics compatible parallel printer for printing Weather Fax. Weather maps and satellite photos, like the one in this ad, can be printed in your shack.

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**IC 02AT/O3AT/04AT**

**R 7000**
General Coverage Receiver

**R 5000**
General Coverage Receiver

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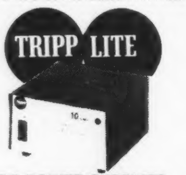

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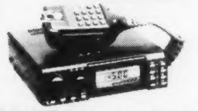

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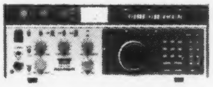

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# RTTY LOOP

## *Amateur Radio Teletype*

*Marc I. Leavey, M.D. WA3AJR*
*6 Jenny Lane*
*Pikesville MD 21208*

Last month I presented a letter from Larry Morgan K7LX, in which he presented some views on the AEA PK-232 data controller. I sent his letter to AEA for comments, and received a response from Mike Lamb, the president of AEA, which I would like to share with you all. Mike writes:

"Thank you for the opportunity to respond to Larry Morgan's comments regarding the AEA Pakratt™ Model PK-232 multimode data controller.

> ***"Yes, RTTY has sidebands."***

"I have recently spoken with Larry by telephone and have determined that he had used a friend's PK-232 which had very early firmware releases. Initial firmware releases did, indeed, have a few AMTOR idiosyncrasies that have since been changed in January, 1987, and March, 1987, firmware releases. At the same time, we also added other enhancements such as weather FAX and the SIAM™ features.

"The PK-232 is factory adjusted for 200-Hz shift AFSK transmit tones. If someone is bothered by this, they can easily adjust two potentiometers for 170-Hz AFSK shift. However, as you will note by the enclosed bulletin (printed below) written by Dr. Alan Chandler K6RFK; it is virtually impossible for the average user to measure any signal degradation caused by a 170-Hz/200-Hz shift difference.

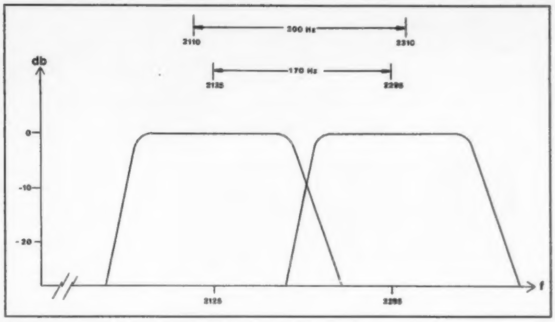
"The PK-232 has a unique modem design that uses the best traits of both AM and FM FSK detection. FM detection allows for easy operator tuning over a wide range of tone shifts. AM detection typically offers better weak signal detection than FM. The PK-232 uses an FM design with Automatic Threshold Correction (ATC) that offers weak signal detection similar to an AM detector. The PK-232 200-Hz receive shift (HF) mode actually sets up the internal demodulator for copying ANY FSK shift from about 85 Hz to 500 Hz (centered around 2210 Hz). The 1000-Hz receive shift (VHF) mode actually allows copy of any FSK shift from about 400 Hz to 1500 Hz (centered around 1700 Hz)."

I thank Mike for his letter, and would like to point out that the PK-232 I am using, as noted last time, does possess the latest, March, 1987, firmware. Let's look at that bulletin on shifts he mentioned. Alan Chandler K6RFK wrote this article, which comes to us through the courtesy of AEA.

### 200-Hz Shift on HF Baudot?

In the early days of RTTY, the difference between the mark and space tone (the shift) was 850 Hz. The wide shift has some advantages on HF as well as one primary disadvantage. The disadvantage is the bandwidth required—850 Hz plus the modulation sidebands (yes, RTTY has sidebands!). The advantages are that the wide spacing compensated for selective fading and the lack of stability of the transmitters and receivers used at the time. As the FCC allowed narrow shift and the stability of the radios improved, 180 and 170 Hz shifts became common with 170 finally becoming the standard. Along came HF packet and a new standard was born: 200 Hz. Can a station using 170-Hz RTTY communicate with a station using 200-Hz RTTY without problems? In a word, YES!

In order to pass the information sidebands, the RTTY channel filters (in an AM demodulator) need to be at least 67- Hz wide and are typically 150-Hz wide. For the FM style demodulator, the input bandpass filter should be at least 350-Hz wide. Both bandwidths assume 45-baud signaling rate. Higher baud rates require larger information bandwidths. When two stations are using the two shifts and are tuned to the same center frequency, the maximum offset in mark or space is only 15 Hz. That is, the difference in shifts is divided between both tones. Even with the sharpest channel filters, the information bandwidth required of the filter will easily allow a 15-Hz offset in the AM demodulators and the Q required of the discriminator in the FM demodulators will also easily pass the extra shift. The same works in reverse. The 200-Hz shift receiving system does have a wider noise bandwidth than a 170 Hz receiving system. This is due to the wider bandwidth filters necessary for 110- and 300-baud operation, for the different shift. At 300 baud, the 200-Hz shift actually has a small advantage over the 170-Hz systems. If someone tells you 170-Hz and 200-Hz shift are incompatible, you are having one of your legs pulled.



*Typical Channel Filters*

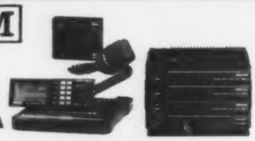
My sincere thanks again to Mike Lamb of AEA, for sharing this piece by Dr. Alan Chandler with us.

AMTOR does have the spotlight this month, and here is another heard voice. Bill Martin, R.Ph. N7EU, of Bothell, Washington, drops his response to many questions raised here. Bill says: "I am an avid AMTORite. I think the main problem I see with new modes like AMTOR is that the fellahs are a bit intimidated by this mode. RTTY is easy compared to AMTOR. You kick on the transmitter and the most difficult part may be getting the other station tuned in properly and getting the tones right-side up. With AMTOR, a lot more is going on, such as linking, time intervals between receive and transmit, different rigs reacting or interfacing with the AMTOR program, or FEC and ARQ modes. Maybe what we need is an article with an overview of AMTOR and its advantages and difficulties discussed. Surely the 100 percent copy is one advantage over RTTY—and the ability to run lower power and still maintain a conversation. And conversation is the key. HF packet seems to have some problems. The operators I have spoken to seem to be dissatisfied with the speed or flow of conversation. In any event, count me in on any AMTOR cheering squad. I use it more now than regular RTTY.

> ***"The PK-232 has a unique modem design that uses the best traits of both AM and FM FSK detection."***

"And still one more little comment about RTTY operating in general. Why are RTTY operators such sticks in the mud when it comes to operating on different bands? There are only two places you will find RTTY used—14.080 to 14.100, and 3.600 to 3.640. Windows for packet and AMTOR are: 14.070 to 14.080 (AMTOR); 14.100 to 14.110 (packet); and 3.640 to 3.650 (AMTOR). This does not make any sense to me. Forty meters is a terrific daytime band for RTTY, but try to find someone there. Also, the 15- and 10-meters band have been opening up, but I have worked only three fellahs on ten meters with RTTY. They got discouraged and left after fruitless tries. So why do these operators jam themselves together in as little spectrum as possible? Let's see a little more activity in the other bands as well. And the excuse that the band is dead is not valid. Many a time I have worked ten meters when it sounded dead—at times as late as 11 p.m. into California. I think a real push should be made to get some sort of calling frequency going on the ten-meter novice band. I have been using 28.190. Any suggestions? If we want to get the novices interested in digital modes, it would seem to

ICOM



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## RTTY Loop

*Continued from page 53*

me that ten meters would be a natural."

Bill raises some excellent points. I often wondered myself why there's so much clustering. At one time, with rocks (crystals) and drifting VFOs, it may have made sense, but now? And as far as the other bands, why not? As they say, use it or lose it—right? I would love to hear all your thoughts on these, or any other, RTTY points.

On the question of an overview-type article on AMTOR, such a topic was presented in RTTY Loop some time ago. In response to the numerous questions I have received asking what has been covered in the more than ten years of this column, I have prepared a RTTY Loop index. If you would like to see what we have been talking about, drop me a self-addressed, stamped envelope, to the address at the head of this column, with postage for two ounces on it, and I will send you a copy of this index, updated to the current published issue of RTTY Loop. Information on obtaining individual columns will be included with the index.

I hope to be a bit more visible on the HF bands, after my antenna-installing adventures this summer. After stalling for some time, and cutting down a dead tree that stood in the way, I finally used a bow and arrow to shoot a line over a tree about a quarter wavelength (on eighty) away from the house. Rope followed line, and antenna followed rope, of course, and the thing loads well through a tuner on all bands. So, as time permits, I hope to pop up on HF bands on an irregular basis.

More reliable modes of communication with me remain the mail (remember to send a SASE if you desire a reply), CompuServe (75036,2501), and Delphi (MARCWA3AJR). If all's well, next month should bring our annual feature, and more goodies right here. ■

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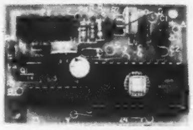

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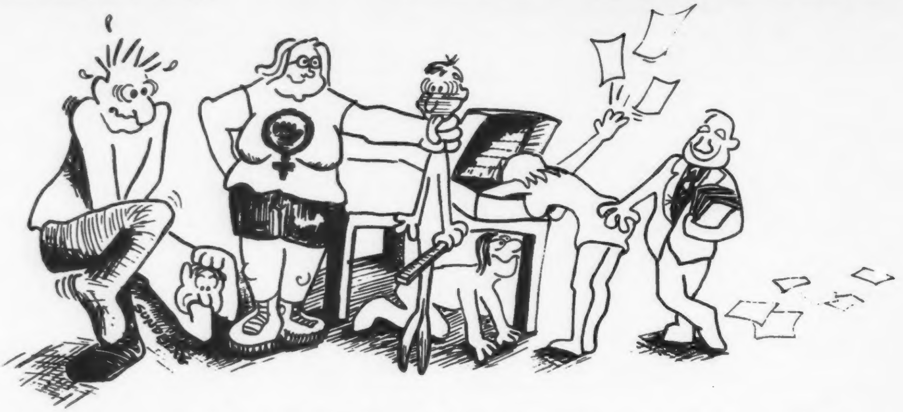
**CIRCLE 17 ON READER SERVICE CARD**

*This story by Bob Manning K1YSD of Rye, NH, appeared in the December 1973 issue of 73. We reprint it as a tribute to Bob, now a silent key.*

# The Greenie



## *An account of a brief and tempestuous contest*

The Wayne Green Award, or *Greenie*, came into existence in much the same way as did penicillin, the St. Andreas Fault, and *me*—by sheer accident!

Recently, an obscure and nameless ham with the solder-wasting, foot-scarring and improbable talent of constructing breadboards with a propane torch, discovered his solder had been dropping into a scrunched-up, cast-off TV dinner plate secreted under his bench.

When—after several pounds had accumulated—the mass was removed and turned upright, it bore not only an amazing resemblance to Wayne Green (dutch boy haircut, turtleneck sweater and all), but two embossed letters, *E* and *L*, from the plate had been reversed fashioned into the glop somehow, making a passable *73*. Thus the Greenie was born!

Its destiny was to be awarded to the ham with the best or most unusual shack.

We (the awards committee), after visiting hundreds of shacks, were gathered in the huge 8 x 10 ft. conference room to decide who should receive the coveted first annual Wayne Green Shack of the Year Award (no double entendre intended!).

To say it was an odd assemblage would be putting it mildly. It was, however, fairly representative. Wayne, himself, was in absentia, having gone off to fight simultaneous duels with the editors of *CQ* and *QST* (FCC Proposals at 300 meters).

Katrina of course was there, representing the YLs. Slightly over 300 pounds of Fem-Lib amateur radio operator, Katrina was, to say the least, imposing. A feminist to the last ounce, Katrina, at the moment, was banging alternately on the simulated alabaster (plywood) table (Wayne spares no expense) and thumping Claude Zister, our technical type, on his emaciated chest, causing him to retch violently at each thump.

Claude isn't a bad sort, despite the fact that he and the slide rule he kept clutched in his bony fist were of unusually similar stature and weight. Only guy I ever knew who made Wally Cox and Twiggy look like Minnesota Fats and Mama Cass Elliot!

"It's gotta be a YL or XYL to win the award!" bellowed Katrina. "You male chauvinists have had it too much your own way for too long."

"Balls!" roared Grunt (at least I think his name was Grunt. He barely spoke below 721 dB over S-9 which, when we first met, numbed my eardrums and I never was sure of what he'd said when he'd introduced himself).

During our inspection tour he yelled into one guy's mike so loudly and so excitedly that he bit the top right off a Shure 444. Grunt was the representative of that new breed operation. The SuperHam! You've undoubtedly met them on the bands.

The SuperHam comes through, on the air, as a fiftyish, loudmouthed, know-it-all clot dedicated to the proposition that only *he* is created equal. He claims squatters rights to *his* frequency, and by virtue of thirty-two series paralleled 4-1000Z's simply opens up and takes over at least 20 kHz of band width. Faster than a millisecond VOX, more powerful than the law allows, able to stomp QRP stations with a single belch. Ooh hoo! Look! There on the air! It's Aurora! It's insane! It's SOOOOPPERHAAAAMM!!!

> ***"Funny, I never did get used to Cecil's attire."***

"And again I say Balls!" roared Grunt. "It's gotta be a station with power, power, P.O.W.E.R. power and more power!"

At this point our secretary, Maggie (the message handler) began rummaging through an oversized Samsonite suitcase, the outside of which boasted (instead of travel decals) stick-on message check-off sheets, HX and ARL numbered references. "Wait a minute. I've got some notes here," she said, scattering message forms and blanks over her shoulder, the table, and the floor.

"Yeah! Hold it!" chimed in Cecil, the certificate hunter, performing a similar act save for the fact that he was strewing certificates hither and yon. (Funny, I never did get used to Cecil's attire: the single breasted oversized WAS certificate for a jacket made from seersucker was bad. The bell bottoms fashioned from quilted CHC memorabilia was worse, but the tie that glowed in the dark showing his DXCC made me feel like someone was stepping on my throat.)

From the corner, Effram, our CW operator, was bleating, "Didah dididit, didah dididit."

Looking up from my navel (which, incidentally, in the last five years has gone from the outward type to the inward type), I began to pound my gavel for order. I, as the appliance operator-klutz-lid representative, was the chairman of this motley group.

"Order, order!" I screamed at the room, which had taken on the appearance of a ticker tape parade due to the fact that Maggie and Cecil were still flinging papers into the air. Katrina was hollering "YL, YL, YL!". Grunt was bellowing, "Balls! Power-power-power I tell ya - ya gotta have power!" and Effram was driving me slightly off my rocker with that "didah dididit, didah didit!" It sounded like a Chinese auctioneer with a cleft palate conducting a sing-along for 200 babbling tambourine thumping chimpanzees.

### Bang, Bang, Bang

Bang, bang, bang went the gavel as I pounded at the chaos. Suddenly I felt several sharp pains just below my spleen and discovered Claude poking me with his slide rule. "Excuse me sir," he said, "but I believe you've just spilled your coffee into your lap."

"Thank God!" I exclaimed, "I thought it was something else."

Some semblance of order finally arrived except for Effram with his "didah divdidit" and "dahdahdidah dah dahdidahdit."

"Grunt," I said, "will you put Effram on break-in and tell him to QRT."

"Huh? Whazzat, boy? You gotta speak up, boy! You need more power. More power, I say. Power, boy slap the ole juice to it till the tubes run rosy red and the transformer fires—power, boy, power!"

Thankfully, Katrina took a hand and solved the problem with delicate feminine expertise. Clamping onto Effram's hand containing a soup spoon with which he was tappy-tappy-tapping something, she jammed both spoon and hand down his throat, coming dangerously close to his liver. Then, in what seemed to be single motion, she grabbed Maggie's oversized attache case, and with a vicious arced swing whomped Grunt approximately 32 inches above his ankles, or at the apex of his V, as we say in the trade.

"Okay," I continued, "now we only got this one trophy to give away. We've seen all sorts of shacks. Suppose we use the process of elimination? I think we can eliminate all the Danish Modern, Colonial and home-antiqued types, right? Any other eliminations? Raise your hands."

A sharp shooting pain under my left eye told me that Claude had raised his hand, replete with slide rule, damn near turning me into a cyclops.

"I think," said Claude, "that we can also eliminate the Japanese Contemporary shack. I mean, after all, 'Ladio Shack?' 'Landom Rength of LG/8U' and 'Loger, Loger OM' is a bit much; besides, the autographed 8 x 10 glossies of Sessue Hayakawa and Richard Loo in bamboo frames? Pfuii!. And how many operators will deliberately live on the side of a hill so they can erect slanted inverted vee's?

"And it didn't got no power neither. No balls at all," chimed in a slightly falsetto Grunt, assuming a cross-legged protective pose as he cast a suspicious eye at Katrina.

"Yeah, and it was all commercial. He didn't have no home brew stuff anywhere!" came a voice from under the table.

"Who the hell is *that*?" I gasped, as a pair of hands and two eyes peered over the tabletop.

"Tis I, Marvin, the home brew specialist."

"Whatinhell are ya doin' under the table, Marvin, the home brew specialist?"

"I'm building a voting machine," Marvin replied, piling soldering gun, heat sinks, dikes and assorted other tools on top of a stack of Maggie's messages and Cecil's certificates.

"Look, old boy, I think I soldered my belt buckle to a table hinge, so I'll just sit here, okay?"

"Fer cripes sakes. Is that everybody?" I said, glancing around the room and under the table, absently noting that Marvin had, indeed, soldered his belt buckle to the table hinge.

"I believe," said Claude, manipulating his slide rule back and forth and making copious notes on a seemingly endless sheet of foolscap, "that we're missing one-point-three persons."

"Whaddya mean, one *point* three persons?"

"Well, Baltimore-Anchorage-Roanoke-Rochester-Yokahama—what a name—the 20 meter, quick QSO kook was captured by an A&P manager and is working the five-items-or-less checkout counter around the corner. He was 'Hi there! You're 5 and 9—that's a dollar 9.80 see you latering' to beat the band the last time I saw him."

"Okay," I said, "That's one—now what's the point three?"

"Oh, that's Giggles. You can't really call him a full ham. I don't know what category he falls into. He's the fruitcake who checks into a net and spends the next 45 minutes tripping his VOX with giggles."

"I know the type. Thanks, Claude."

"Think nothing of it," said Claude, making a magnanimous arm-sweeping gesture, catching me across the bridge of the nose with that goddam ruler.

**"We're missing 1.3 persons."**

"I think you just deviated my septum, you....."

"Didididit didit" "Didididit didit" came from the end of the table.

"Claude, why don't you go down and teach semaphore to Effram and take that mathematical pogo stick with you." I said, wiping a tear from my eye and a spot of blood from my nose.

### The Process of Elimination

"Okay, any more eliminations?"

Katrina jumped to her feet (this act by its sheer spontaneity caused Grunt to explode backward against the wall—not an easy feat when you're in a 'September Morn' pose). "I think," said Katrina, casting a threatening look at the folded-up Grunt, "that we ought to eliminate that Swedish Convertible shack also. Really! A Myra Breckenridge receiver and a Christine Jorgensen transmitter. That's carrying synthesis too far. No knobs, no meters no dials, no nothin', just *one big switch* —or is that *swish*?"

"And it didn't got no power at all. Ya gotta have oomph, guts, punch. Ya gotta have balls!" said Grunt.

"I agree," said Claude, "the absence of a ball bearing drive mechanism on the vfo renders it virtually useless, and I think Effram will agree that a 'marshmallow key' for limp wrists is impractical. Right, Effram?"

"Didahdit didahdit" said Effram.

Just then a "giggle giggle" came from the intercom.

"Giggles, will you get the hell outta the waiting room, quit giggling into that intercom, and join us?"

"Right, Bob-giggle-giggle—but ya know I sort of liked that 'Liberal' shack we saw. You know the one—entire place bedecked hippie style with flowers, beads and black lights using a Lysergic 25 receiver, MaryJane transmitter and a Horse Amplifier—hey, and the wattmeter labeled 'Flower Power', log books called a 'trip sheet' and all those petitions. Like the one petitioning all magazines to include a supplement to their "Who's Who" columns entitled "Who Dat?" and that jazzy antenna erected in the form of a 65 foot peace symbol. That's today, Bob!"

"Charlie, Charlie" said Maggie.

"According to my calculations, the damned thing won't work, Giggles!" said Claude.

"Precisely! It's IN" said Giggles.

"Balls!" said Grunt.

"Do I record all this talk as one message or can I count each quote as a separate message?" asked Maggie.

"Hey, yeah! And do I get a certificate for attending this thing?" queried Cecil.

"Look, we're here to hand out this trophy. Now with the Emmys, Oscars, Grammys, and all the other awards handed out, it's pretty hard to go through a liftime without receiving an award!"

"You're right, Bob. I know a guy who got an award for never having received an award!"

"Look, Marvin," I said, "if you can unsolder your belt buckle without doing yourself any permanent genetic injury, will you get up above the edge of the table, and we'll get this thing settled.

"Now," I began, "as I see it, in order to please everyone, we've got to give it to a YL running in excess of 10 KW on CW for quickie QSO's on 20 meters who receives an occasional BPL, has a good standing in the CHC and has built her entire shack in Early Halloween or Contemporary Junkyard all by herself and can giggle her VOX on phone, right?"

"Oh, Lord," I said. "Well, Wayne's always saying to get the lead out."

"Giggle, giggle."

"Maybe we could build a parabolic dish out of it," said Marvin.

"Put a number on it so I can log it," said Maggie.

"Hell, let's stamp BPL on it and GIVE it to Maggie," said Katrina.

"Can I keep it as a certificate," asked Cecil.

"With extreme calm, I walked to the window and threw the melted glob, my gavel, the buckle-spoon-ruler combination and two handfuls of messages and certificates into the street. Then, as an afterthought, I picked up the still "didididit didit - didididi didit"ing Effram and flung him after his spoon, receiving the ultimate satisfaction of hearing him speak his first real word "HHEELLLLLLLPP!!!"

"Oh, Lord!"

"Balls!" said Grunt, Katrina, Maggie, Marvin, Cecil, Giggles, and I in unison. And, from the sidewalk, we heard "didahdit" thus putting an epitaph to the Greenie.

# NEW PRODUCTS

*Compiled by Rebecca Niemela*

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### THE REGENCY R1080

A moderately-priced programmable scanner that features search, weather scan and a priority channel has been announced by Regency Electronics.

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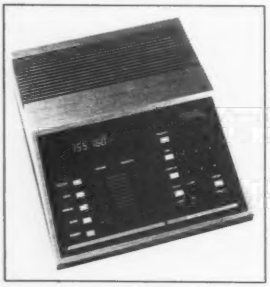

*The Regency R1080 from Regency Electronics.*

The scanner can be programmed to scan as many as 30 channels, or search entire frequency ranges to find active new frequencies. When the "weather scan" key is pressed, the scanner automatically searches all National Weather Service frequencies to find the active frequency in seconds. If a transmission is noted on the priority channel, it will automatically switch to the channel so that important transmissions are not missed.

Other features include channel lockout, for skipping channels not of current interest, fast and slow scan speeds and a memory backup system that uses a capacitor instead of batteries to save frequencies during power outages and when the scanner is unplugged. The price is $199 with a one-year warranty.

For further information, contact Regency Electronics Inc., 77077 Records Street, Indianapolis IN 46226 or circle Reader Service Card #201.

### SR 100 AND SMART REMOTE

Satellite Technology Services, Inc. has begun marketing its new SR 100 receiver and a companion remote control unit, the Smart Remote programmable controller.

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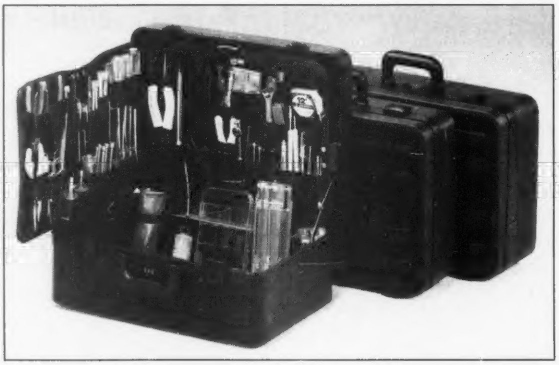
Available only from Jensen Tools, these cases are now an option for the JTK-87 Electronic Engineer's Tool Kits, and for the JTK-17, 11, 54, 75 and 76 kits. Other kits may be adapted to Rota-Lux and Rota-Tough cases by special request.

For more information and free catalog, write or call Jensen Tools, 7815 S. 46th Street, Phoenix AZ 85044 (602/968-6231) or circle Reader Service Card #202.



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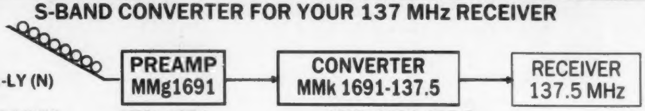

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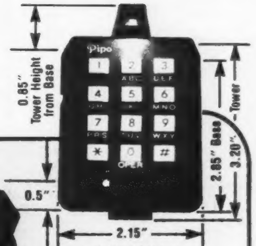

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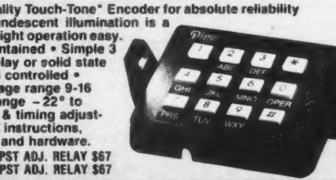

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| 144 MHz | 4 Element | 3'8" | 8.9 | 44.00 | | | | | |
| 144 MHz | 9 El Portable | 11'4" | 13.2 | 60.00 | 1296 MHz | 23 Element | 5'9" | 18.0 | 59.00 |
| 144 MHz | 9 Element | 11'4" | 13.2 | 55.00 | 1296 MHz | 55 Element | 15'1" | 21.5 | 89.00 |
| 144 MHz | 2 x 9 Cross | 11'8" | 13.2 | 86.00 | 1296 MHz | 4 x 23 Quad Kit | 5'9" | 23.5 | 325.00 |
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# HAM HELP

## Your Bulletin Board

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*Also, write numbers carefully—a 1, for example, can be read as an l or an i or a 7 as a 1. Thanks for your cooperation.*

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**A.Campo**
**816 West Knapp St.**
**Rice Lake WI 54868**

I am looking for a Webster (or Sears, made by Webster) wire recorder/player, any condition, preferably working. I need to transfer about 30 reels of wire to cassette. Any reasonable price paid and any information greatly appreciated.

**Bill Nohrn W5UNB**
**8820 James NE**
**Albuquerque, NM 87111**

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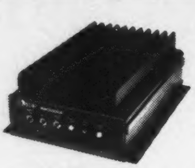

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# ABOVE AND BEYOND

## VHF and UHF Operation

*Peter H. Putman KT2B*
*3353 Fieldstone Dr.*
*Doylestown PA 18901*

### FALLING OUT OF AUTUMN

(Wolfe Island, Ontario, Canada) As you read this, the leaves are falling (or have fallen), the air has taken on a chill, and hopefully the tropo activity has been above average. As I write this, however, it's still the "dog days" of August, with a steady breeze blowing over this relaxed site on the Canadian Channel of the St. Lawrence River, in grid square FN14.

Yours Truly effected a move to Pennsylvania back in May with the intention of expanding my real estate holdings and pursuing a somewhat more rural existence. Not the least of my considerations was a better site for VHF and UHF activity, but the demands of moving, remodeling, and a lot of business travel put the station equipment and antennas in cold storage for longer than I care to admit.

However, now being possessed of one acre of land, I decided to take the plunge and install a new tower—specifically, the W-51 manufactured by Tri-Ex of Visalia, California. This particular unit is a three-section crank-up type, measuring about 20 feet when fully collapsed, and 51' 3", when fully extended. It's rated at 9 square feet windload with the proper anchorage, and checks in at about 400 pounds. Many of my contemporaries had considerable success with similar units, especially while using Belden type 9913 RG-8 cables for VHF and UHF feedlines.

I had employed a variety of antenna support systems at my old residence in New Jersey—roof towers, chimney supports, house brackets and a 40-foot fixed tower commonly used for TV antennas. As the system expanded, so did the number of antennas and linear feet of coax pressed into service. In short, my antenna system grew out of control like some crazy vine as each new band or antenna was added! Shortly before the sale of my house, I had 16 antennas and over 1400 feet of coax in service, not to mention various dead-ended runs of old CATV hardline and worn-out rotor control cables.

### Mixed Blessing

Buying a house can be a mixed blessing. After all, you do agree to pay an unearthly sum each month to your bank for the privilege of owning one, maintaining the building and grounds, and paying taxes and insurance on top of it all. On the other hand, if you happen to be a diehard VHF/UHF operator, a new house looks more like a "clean slate" from which all of your previous mistakes, failed arrays, coaxial Gordian knots, and hare-brained guying jobs have been erased. Like the prisoner on parole, you have a chance to set the record straight and start all over again.

I made the most of this golden opportunity by doing absolutely nothing about it for the first two months, which my wife considered an immediate improvement over my previous arrangement. "I hardly notice your antennas this time!" she exclaimed, "Why couldn't you have set it up that way back at the old house?". Why not, indeed. Well, after considerable thought, I decided against giving into temptation and leaving the hobby for good to pursue a beer can collection. I would indeed grace the skyline of my neighborhood with aluminum, and the W-51 would be my packhorse.

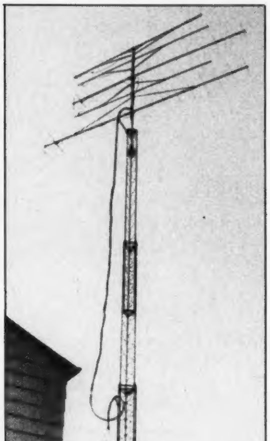

*Photo A. The W-51 tower loaded up and extended to 80% of full height*

Which bands to operate? What types of arrays to put up? How much coax to use? How to position the tower away from the dining- room window? Why do I have to have a building permit? These are all questions I pondered as the preparations moved forward. The last was the ticklish one: The township in which I live does permit towers, as long as they are set back 1-1/2 times their height from the property line. There might be room for a PRB-1 case here, but my property lines were sufficiently far removed to allow the W-51 with a fair amount of yagis atop it, so no real ruckus was raised.

> ***"A new house looks more like a clean slate from which all of your previous mistakes...and hare-brained guying jobs have been erased."***

I contracted with Mike Crawford WA2VUN of Tri-Delta in Fairfield, NJ, to provide me with (1) The W-51 (2) a suitable rebar anchorage (3) a custom easy-leveling baseplate and (4) 16 feet of 1/4"-wall 2"-hollowbar mast material. The next step was to dig a hole, which sounds easy, but is best left to someone who doesn't mind shoveling dirt vertically while standing in a space smaller than a phone booth. I began the excavation by preparing a hole 3 feet deep by 30" square, lost ten pounds sweating, reconsidered the project over a beer, and called a local contractor to finish the remaining 2 feet and pour the base.

### Caveat Emptor

Remember the old Latin saying, "Caveat Emptor!" (Let the buyer beware!) Cement contractors must have this on their coat of arms. After many calls and much haggling, the contractor came out and excavated another foot of dirt with the intention of pouring a 12-inch lip around the base to make up the difference. Uh-uh! said the Building Inspector. That hole was going to be 5 feet, 6 inches or else! After a few more calls and a spirited discussion of how deep a five-foot hole really was, the contractor came back and finished the job.

In short order, the concrete was poured around the custom rebar anchorage Mike had welded together, and I was ready to erect the tower—which showed up almost a month later. A good omen: Almost every tower shipped to Mike in the past had been damaged by improper handling with a forklift, usually resulting in the "W" braces snapping loose. Well, this time we got lucky as my W-51 came through with nary a scratch. Mike showed up good and early one morning with the tower, plate, and numerous bolts to anchor it. It was a fairly simple matter for the two of us to slide the tower off his truck into place, and pivot it upright. After some leveling, the tower was ready.

At this point, I discovered that I hadn't cut the grass where I had placed my disassembled yagis in over 8 weeks. In the process, I'd completely lost track of my 55-element 1296 yagi, my 2-meter Boomer, 7-element 6-meter beam, and a handful of 21-element yagis for 70 cm and their boom braces. A tedious hour of mowing followed (during which I nearly chopped up a 44-element KLM yagi for 23 cm) and most of the yagis were rescued from the clutches of rye grass and weeds. Several spiders and at least one mouse had taken up residence in these sturdy structures, resulting in a general fumigation session.

Like an adventurer returned from Africa, I laid my treasures on the newly-mown grass, and set about cutting new coaxial feedlines. In the past, any cable at hand had been pressed into service. Thanks to QEP's gigantic going-out-of-business sale (which may still be in progress—they had that much cable left) I picked up 750 feet of brand-new Belden 9913, 400 feet of 8214, and 100 feet of Carol 8 conductor 16-gauge rotor wire. QEP's also supplied me with innumerable N connectors fitted for these cables as well as a large supply of PL-259 plug assemblies.

A few hours with a calculator, the W-51 manual, and a tape measure probably saved me a lot of grief later. Careful calculations resulted in the correct length to get each feedline down from its particular yagi through a rotor loop and two coax arms to the special weatherproof window-entry box I'd constructed earlier. The W-51 manual provided a lot of useful information regarding the slack between the arms, distance between sections both collapsed and extended, and positioning of the rotor cable for the Ham-IV rotor to be installed. One mixup occurred with the mast; it was cut 2 feet too short at 14 feet, precluding use of the 6-meter yagi. In retrospect, this wasn't so bad since that same yagi needed extensive repairs from the June VHF Contest and couldn't be installed.

### The Lineup

The antenna lineup wound up as follows: A 55-element Tonna yagi for 1296 work at the top of the mast, raising it 65 feet above the ground with the tower fully extended. Two feet below that, I placed the top 21-element yagi of a stacked Tonna 70 cm combination. Two-and-one-half feet lower found the 220 Cushcraft Boomer and the bracket for the 70-cm power divider. Another 2-1/2 feet lower was the bottom half of the 70 cm array, and the 144-MHz Boomer was secured about 3 feet down from here. With over 2 feet of the mast inside the tower, that gave me virtually no room for the 7 LD, so it will have to be consigned to the roof tower.

Raising the mast was quite a chore, even with a gin pole. I had elected to employ a 2″ thrust collar as extra insurance (with strong memories of the last hurricane that passed through the Northeast) and the fit was snug, to say the least. Also, owners of W-51 towers can attest to how painful it is to stand on the edge of those "W" braces for any period of time, even with heavy boots on. Add the hot sun and a horde of inquisitive (and annoying) yellow jackets, and you've got a project that's less than fun.

Once everything was in place, I allowed for a 4-foot rotor loop and adjusted the top coax arm to take all of the strain. The bottom arm is offset by about 45 degrees and supports all but about 10 feet of cable which forms the drip loop from the tower to the second-floor window entry. This latter system accomplished my first major goal: Get the feedlines off the ground and out of harm's way! When fully cranked, there's sufficient flex in the 9913 cable to allow for a full 360-degree rotation without any kinking, but the drip loop is maintained, accomplishing my second major goal: Keeping any water and ice out of the N connectors.

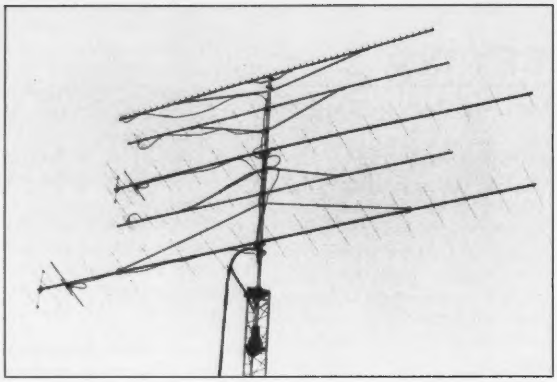

*Photo B. Close-up of the 2m–23cm arrays on the W-51 tower.*

Despite the time and care invested in cable assembly work, I still had my doubts, so out came the IC-375, IC-475 and IC-1271 for a quick test. Connecting the 220 coax brought an immediate S9+40 dB signal from WB2NPE in Tabernacle, New Jersey. All was well there, and we exchanged brief reports. The Bird 43 showed about a 1.3:1 swr here. A quick call to WB2WIK over 50 miles away on 220.120 resulted in skeds for 432 and 1296, the latter with only 8 Watts up the feedline. Results? Better than 1.2:1 on both bands, and S9 +40 dB reports from Steve on 432 with S9 +10 dB on 1296. It was a success!

Photo A shows a view of the entire tower in a semi-extended position, while Photo B shows a closeup of the VHF/UHF array. The conclusions I drew from this project were many, but here are the key points: First, use the best coaxial cable you can. Keep those old runs in the junkbox, and buy new cable for such a job. Second, pre-plan carefully to avoid surprises while on the tower. Measure cable lengths carefully, and measure again. Allow sufficient length for rotor loops and support arms as well as drip loops. Third, assemble your feedlines with care and ring them out on the ground. A good rule of thumb that I follow is to check all of the cables on the highest band you'll use to measure losses. Make sure your connections are of the highest integrity and waterproof them.

Finally, take your time. Admittedly, I carried things a bit overboard in that department for 4 months, but once the wheels got rolling I proceeded at a leisurely pace (no doubt missing all kinds of intense E-skip and tropo in the process) to insure that once it went up, it stayed up. Let's face it: Climbing towers really isn't that much fun. It's a chore and the whole point of this exercise is to keep me on the air, not up in it. Plan and execute your work as if you'll never get a chance again to get back up that tower. (Did I just hear a mast-mounted GaAsFET explode?)

### Random Notes

Larry Price N7BNJ has purchased the inventory of 8877 amplifier kits from Gene Shea KB7Q of "Q" Products. Effective immediately, the new address for "Q" Products is: 10412 36th Street East, Puyallup WA 98372. I also see from the 2- meter EME Newsletter that Mike Stahl K6MYC (one of the founders of KLM) is selling 5-wavelength yagis for 2-meters and 13- wavelength 70-cm yagis. He can be reached at M2 Enterprises, 1600 Decker Avenue, San Martin CA 95046.

### Tropo Dept.

The past summer E skip season was sensational, so why should we expect any less from the fall tropo season? At the end of August, the weekly nets of the Mt. Airy VHF Society (PackRats) were in full swing, beginning on 50 Mhz at 7:30 local EST and continuing right on up to 23 cm at 9:30 PM. This would be an excellent opportunity to check out the new tower and antenna system, so I cranked it up and ran through all 5 nets.

The surprise of the evening came when Bernie Bonnar VE1UT of Yarmouth, Nova Scotia checked into the two meter net with an S9 +40 dB signal. Normally this isn't unusual for him, but the strength of his signal definitely was. The 220 Mhz net started at 8:30 PM and sure enough, there was Bernie pushing the S meter over 9 on peaks while running 8 Watts to a Boomer. Contacts were quickly exchanged with the net stations, and we proceeded to 70 cm at 9:00.

This time Bernie was hitting peaks almost as strong as those on 2 meters! At least 6 operators in the area had armchair copy with him over a path which exceeded 450 miles. Both myself, Roger Amidon K2SMN and Steve Katz WB2WIK encouraged Bernie to drag out his LT 23S transverter and fire up with 8 Watts just for the heck of it. We operated full duplex from 70 cm to 23 cm to help in peaking the antenna headings, and contact was established with K2SMN first (no wonder, considering he runs 200 Watts to 4 X 45 element loop yagis at 175 feet!).

I gave it a shot with just 8 Watts to 55 elements, thinking I heard Bernie's carrier, but it wasn't enough. I knew I should have connected the 3CX100 amplifier in the line! Finally, Steve WB2WIK managed to make a two-way running 80 Watts to his 55 element yagi, copying Bernie about an S5. All of us read VE1UT quite well on 70 cm for the better part of two hours, with Steve reporting signal peaks close to 50 dB over S9 at times (Bernie was running about 100 Watts on 70 cm to a single RIW 19 element yagi).

Not bad for the beginning of September. Will we see a repeat of the fantastic Thanksgiving and Christmas tropo of 1986? Based on what I've heard so far this year, I wouldn't bet against it. Better keep your receivers on 144.200, 220.110 and 432.110 this fall!

Next month: A compilation of VHF/UHF newsletters and clubs. Also, reviews of the IC-12AT handheld, and a report on the September VHF Contest. Until then, see you Above and Beyond!

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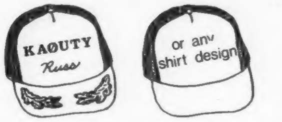

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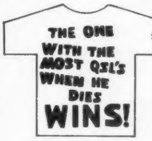
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# LETTERS

*Continued from page 45*

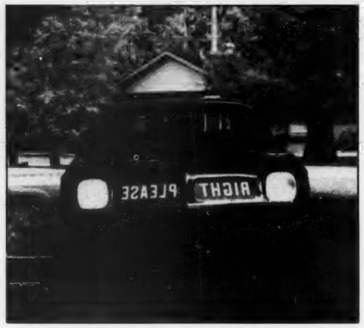
## ESAELP THGIR

Being a radio and car buff like yourself, I've always appreciated the fine anti-55 articles you've written in *73 Magazine*. Since you've asked to hear from other hams who may have experience with radar, I'll comment.

Our ignorant leders believe slower traffic results in fewer accidens per mile. To help achieve this unworthy goal, most police agencies carefully avoid enforcement of lane-discipline. As long as self-appointed rolling-road-blocks move over for the police, they are safe from the law.

I might suggest, Wayne, that your next article on driving address the very real problem created by the typically lazy/belligerent American driver: lack of lane discipline. It is, as you may realize, a national disgrace. Foreign visitors are appalled at the current situation.

SUNSHINE STATE
K4FWJ
FLORIDA



It is an embarrassing predicament that apparently must be solved by the private sector. The group called Citizen's Coalition for Rational Traffic Laws is currently mounting such a worthy campaign, and it needs all the help it can get.

**Art Kobres K4FWJ**
**Lutz FL**

*Thanks for your letter—love your front car sign! Reminding the 73 readers about road courtesy probably won't help significantly, but we'll give it a try.*

*—Wayne*

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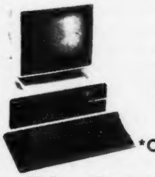

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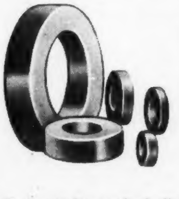

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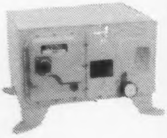

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| Part No. | Description | Price |
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| PL-259/USA | UHF Male Phenolic, USA made | $ .50 |
| 83-1SP-1050 | PL-259 Phenolic, Amphenol | .75 |
| 83-822 | PL-259 Teflon, Amphenol | 1.45 |
| PL-259/ST | UHF Male Silver Teflon, USA | 1.30 |
| UG-175 | Reducer for RG-58 | .20 |
| UG-176 | Reducer for RG-59 & MINI 8 | .20 |
| UG-21D/U | N Male RG-8, 213, 214, Amphenol | 2.95 |
| UG-21B/U | N Male RG-8, 213, 214, Kings | 3.75 |
| 9913/PIN | N Male Pin for 9913, 9086, 8214 fits UG-21D/U & UG-21B/U N's | 1.50 |
| UG-21D/9913 | N Male for RG-8 with 9913 Pin | 3.95 |
| UG-21B/9913 | N Male for RG-8 with 9913 Pin | 4.75 |
| UG-146/U | N Male to SO-239, Teflon USA | 5.00 |
| UG-83/U | N Female to PL-259, Teflon USA | 5.00 |

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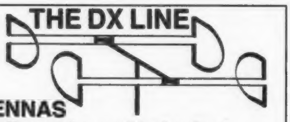

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**II-DX, 2-element, directional,** gain 1 "S" unit over a dipole, with 20dB nulls. Turning radius, vertical polarization, 0.07λ; horizontal, 0.13λ. Standard models pretested, partly disassembled, and marked for reassembly; kits partly assembled, user furnishes simple PVC parts. All with complete instructions.

| | Std. | Kit | | Std. | Kit |
|---|---|---|---|---|---|
| 2-M | $ 49.96 | None | 12-M | $261.75 | $191.67 |
| 6-M | $105.55 | $ 85.33 | 15-M | $299.75 | $225.39 |
| 10-M | $239.50 | $175.19 | | | |

Above models in stock; ask for prices on other frequencies.

**DX Hidden Asset,** broadbanded, gain equal to a dipole. Bi-directional horizontal or omni vertical. Designed for indoor mount; space required 0.1λ in direction of polarization, 0.125λ at 90° (See *73*, Feb. 1984).

| | | | |
|---|---|---|---|
| 2-M | $39.95 | 12-M | $63.95 |
| 6-M | $47.95 | 15-M | $67.95 |
| 10-M | $54.95 | Plans only | $12.50 |

Other frequencies, prices on request, including low-band.

**Antenna Mounts,** mobile, up to 12-M

**DX Quickshift,** patented; antenna up or down with one hand. $69.95, and patent available for sale or license.

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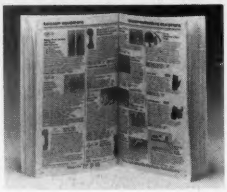

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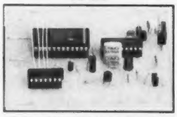
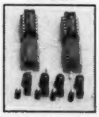

TD-16


TD-16A

**TD-16 DECODES ALL 16 DIGITS PLUS ONE 4 DIGIT SEQUENCE**
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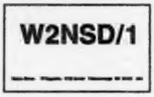

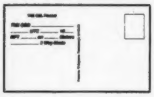

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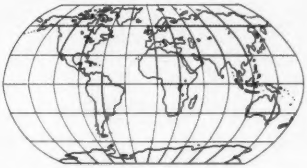

Yes, places you've never even heard of! Nearly 400 DX countries gleaned from the Awards Lists of dozens of IARU members—more countries than any other map available anywhere! ARRL's DXCC map doesn't even come close!

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## *Classics* From 73's Library

- ***The Magic of Ham Radio***, by Jerold Swank W8HXR, begins with a brief history of amateur radio and Jerry's involvement in it. Part 2 details many of ham radio's heroic moments. Hamdon's close ties with the continent of Antarctica are the subject of Part 3. In Part 4 the strange and humorous sides of ham life get their due. And what of the future? Part 5 peers into the crystal ball. Only $4.95.
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- ***Master Handbook of Ham Radio Circuits***, by the Editors of *73 Magazine*. A rich collection of more than 100 practical, unique, tested circuits created by hams for hams. A mere $8.95!
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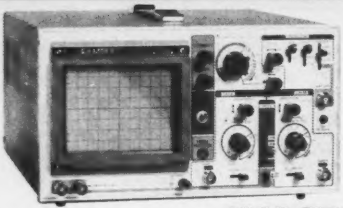

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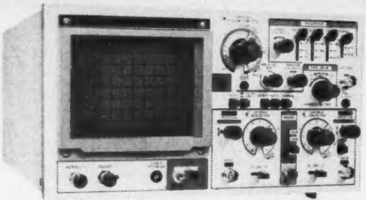

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All include high quality 1:1, 10:1 hook on probes, instruction/service manual with schematic and component layout. 1 year warranty.

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| CT-90 | 10 Hz-600 MHz | < 10mv To 150 MHz<br>< 150mv To 600 MHz | 1 PPM | 9 | 0.1Hz, 1Hz, 10Hz | 169.95 |
| CT-50 | 5 Hz-600 MHz | LESS THAN 25 mv | 1 PPM | 8 | 1Hz, 10Hz | 189.95 |
| CT-125 | 10 Hz-1.25 GHz | < 25mv @ 50 MHz<br>< 15mv @ 500 MHz<br>< 100 mv @ 800 MHz | 1 PPM | 9 | 0.1Hz, 1Hz, 10Hz | 189.95 |
| CT-90 WITH OV-1 OPTION | 10 Hz-600 MHz | < 10mv To 150 MHz<br>< 150mv To 600 MHz | 0.1 PPM | 9 | 0.1Hz, 1Hz, 10Hz | 229.90 |

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Produces upward and downward wail. 5 W peak audio output, runs on 3-15 volts, uses 3-45 ohm speaker.

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**FM MINI MIKE**

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CIRCLE 34 ON READER SERVICE CARD

# HAMSATS

## Amateur Radio Via Satellite

*Andy MacAllister WA5ZIB*
*2310 Romayor Court*
*Pearland TX 77581*

November promises to be a great month for satellite enthusiasts. Early in the month, The Radio Amateur Satellite Corporation (AMSAT) holds its General Meeting and Fifth Annual Space Symposium. AMSAT-Oscar-10 should return to service. While Fuji-Oscar-12 continues with a mix of mode JA, JD and recharge, the RS-10/11 combo brings us more mode A, K and T. There's something for everyone in November.

### AMSAT Meeting

As reported last month, the yearly AMSAT meeting will be held in Southfield, Michigan, near Detroit, in conjunction with the AMSAT Space Symposium. Mark November 6th through the 8th on your calendar and plan to attend the most ambitious AMSAT gathering to date. If you are not yet an AMSAT member, but would like to attend, call AMSAT at 301/589-6062 and request registration materials.

The primary program track is loaded with topics to interest hamsat chasers. There will be reports on the satellites now in orbit, including A-O-10, F-O-12, RS-10/11 and UOSATS 9 and 10. Details and progress reports on Phase 3C, A-O-10's replacement; and Phase 4, the geosynchronous hamsat for the 1990s, will be presented. Other talks will cover new technology, such as digital signal processing, amplitude companded sideband and advanced software for satellite applications. You can also hear discussions about future manned space flight, or ham-in-space activities.

For those of you with a more general interest in satellite activities, there will be an alternate track of presentations staged concurrently with the primary hamsat talks. Some of the topics in this group include: classroom applications of satellites, visual observations, orbit prediction, listening to manned missions, weather satellites, the EDSAT and NUSAT programs, and home equipment considerations.

### OSCAR 10

On August 11th the A-O-10 ground-control stations decided to remove the satellite from service for up to 90 days. Early in the month, the beacon (a usually constant carrier on 145.807 MHz) began frequency shifting (FMing). After that, the transponder shut off several times. Ground-control felt this indicated low battery charge.

Originally, it was hoped that A-O-10 operation could be allowed through the end of August. Three factors caused A-O-10's early removal from active service.

The satellite's solar panel orientation with respect to the sun constantly changes. When the panels are perpendicular to the solar radiation, the spacecraft receives maximum power. As the angle changes, available power is reduced. Based on past experience, the satellite controllers believed operation could continue through the end of August without problems. However, we do not know the precise orientation of the satellite. It has been a long time since A-O-10 was capable of relaying its telemetry and thus its orientation.

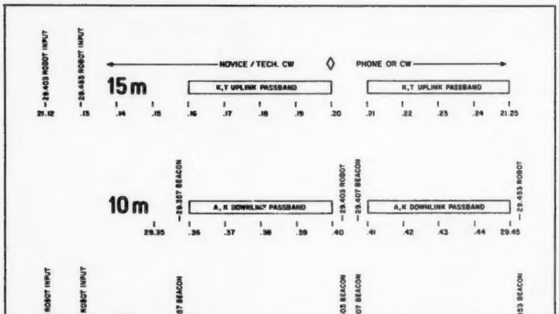

*Fig. 1. Frequency chart for RS-10 and RS-11.*

*Photo A. Fuji OSCAR 12 mobile operation from N6DGK.*

A second reason for the early loss of satellite activity could be due to the charging circuit on board the spacecraft. Normally the Internal Housekeeping Unit (IHU) determines the operating conditions for the battery-charging circuit. With completely random values in the radiation-damaged memory, the information being sent to the charging circuit could be anything from no charge to full charge. If the battery voltage falls below 10.5 volts, an independent watchdog circuit overrides the computer-controlled switching regulator and connects the 36-volt solar array directly to the 14-volt battery. While this may seem like a good high-power solution, it is not. When the solar array is pulled to such a low voltage, efficiency is lost. The current available to charge the battery does not increase as the voltage decreases and the power transfer is much less efficient.

Since nothing can be done about the sun angle and battery charging circuitry, satellite user operating procedure will have enormous effect on the life of A–10. Heavy use by high-power stations can cause irreparable damage to the battery. Operation of any kind during eclipse can have the same impact. When A-O-10 is released for operation in November, keep your transmit level limited to 100 Watts effective radiated power (ERP). That's 10 Watts to a 10-dB beam antenna. Also, do not operate outside the allowed time periods and monitor the AMSAT nets for updates.

### FUJI-OSCAR-12

When A-O-10 activity came to a dramatic halt in August, schedules for satellite operation from the JARL ignited interest in F-O-12. Even though the time allocated for the digital transponder is more than the analog, or JA mode, many stations previously upset by the lack of scheduled activity have returned to F-O-12. The schedules have projected operating times for about a month. This isn't enough for reporting here, but if you monitor the AMSAT nets, or are an AMSAT member, you can get information on the air or via the "Amateur Satellite Report", AMSAT's bi-weekly newsletter.

For those of you who have just begun or are considering satellite contacts via F-O-12 mode JA, some recent studies suggest a change in previous operating methods. In the past, all satellite stations have been requested to keep their receivers set on one frequency while varying the uplink, or transmitter frequency, to counter the effects of Doppler shift. This procedure does well for A-O-10 mode B using 435 MHz up and 145 MHz down. When the reverse configuration occurs with 145 MHz up and 435 MHz down, as with mode JA on F-O-12, moving the transmitter actually cre-

# LOOKING WEST

*Bill Pasternak WA6ITF*
*28197 Robin Ave.*
*Saugus CA 91350*

### All Is Not Well In Enhancement Land

I hate to tell you this, but there are some people out there in Hamland who cannot accept the fact that their day of holding back the progress of hamkind has come to an end. The "Day of the Advanced and Extra" is waning and they will be replaced by the Novice!

No, this writer is not living in some far-off world of his own. Happily, this "west-coast world of nuts and kooks" where I reside appears to be causing the least problem to the newly enhanced Novice operators. I hate to point fingers, but this seems to be an east-coast and mid-west problem. It's also a problem that most hams refuse to acknowledge, to face, or to remedy. But, don't take my word for it. Let me quote a well-respected journalist and truly dedicated ham.

### *220 Notes* Tells All

Art Reis K9XI is the editor of *220-Notes*—the 1 1/4 meter special interest newsletter. He is also among the most honorable people I am fortunate to consider as a friend. In his June 1987 issue, Art noted the following:

"This is one of those times when I feel like I'm preaching to those already saved. The subject is the treatment of Novices by upperclassmen of this hobby and, to tell the truth, what I am hearing from out in the hinterlands is a super mixed bag.

"In my particular bailiwick, Chicago, acceptance of Novices on the 220 band appears to be rather universal. On the other hand, I'm hearing all sorts of horror stories from a few other metropolitan areas and from a number of rural areas, about how Novices are being shut out or mistreated when they try to make their way onto the band to do their thing.

"The harassment, assuming it exists, is allegedly taking two forms. In the first scenario, local 220 repeater groups or owners are telling local Novices to keep off, or are closing their machines to them until they become 'real hams'.

"The second scenario is found in those areas where 220 machines are fewer in number, and where there may be none within HT range. In the stories that I am hearing, local ham clubs are refusing to get involved with 220 at all because their members don't want to mingle with Novices on repeaters! This is one scenario I have heard from my friends in the Illinois Repeater Association, so I know that it happens."

### On Ten Meters

If only this was the only report of hate toward the enhanced Novice operators by the holders of higher class licenses. But it appears to not be limited to either the 220-MHz band nor is it limited to Illinois. It's also happening on 10 meters. I've heard about this problem firsthand over the landline. Usually, it goes something like this:

The hate mongers among us, fearful that their private domain is being threatened by the newcomers, sit in ambush. They wait for some unsuspecting Novice to come on the air for the first or second time. Sometimes they answer his CQ, and in other cases, they let him be the one to answer their general call. Either way, they get the unsuspecting shnook into what at first seems to be a friendly one-on-one contact. Soon, four or five other stations join in, and in short order the "friendly QSO" degrades into a name-calling contest with the higher class licensees doing the name calling! Many times the insults are ethnic or racial in nature; rarely is a real cussword used. These cowards may be hate mongers, but they are far from stupid. They well know that these days, to be caught saying even one of the banned "10 dirty words" on the air will lead to a quick license revocation, or worse. More often than not, these tirades, which sit on the legal edge, sometimes go on well after the Novice has left the frequency. Let's give this practice a name . . . Novice Baiting.

### Who Are These Creeps?

Who are these Novice Baiters? They appear mainly to be higher-class licensees living along the eastern-seaboard and into the south and south-central states. Notice I said *higher class* licensees as opposed to *long-term* licensees. Judging from their voices, most sound like middle-aged people as opposed to the elder statesmen of our service.

I'll bet that some of you have heard these wolf packs in action, also . But, to "protect the image of Amateur Radio," you turn the other cheek! After all, since you are being nice to Novices, it's "really not your problem." Or is it?

### It's Your Problem, Too

Let me turn again to the writings of Art Reis K9XI to show you why you must care; why you must get involved with running the "Novice Baiters" off the air so that the new Novices can have a chance to mature into viable amateurs and thereby enhance our service. What is happening here is a violation of the spirit of this hobby—no question about it. But it goes deeper than that.

> ***"Soon, four or five other stations join in, and in short order the 'friendly QSO' degrades into a name-calling contest with the higher-class licensees doing the name-calling!"***

Amateur radio is a microcosm of society. The Novice licensees are the children (chronological age has nothing to do with it) in our society. The children of any society are the future of that society. Novices represent the future of amateur radio. We must realize that those moves to harass the Novice out of the privileges which are now the law or any move to mistreat a Novice who shows up for the first time on the local 220 repeater, local 220 simplex net, or the 10-meter Novice Phone band amounts to *de facto* abuse of the future of our hobby. Any decision by your local club to abandon a recently proposed 220 repeater project because "those creatures would show up on it," is reprehensible, and I for one will fight tooth and nail against it.

The leadership of clubs who practice "Novice Obstructionism" (i.e., those who believe that "Novice" is spelled "No-voice") are in for political trouble. Remember that Novices who have the fortitude to stick it out do grow up to be Technicians, Generals, Advanced and even Extra-class licensees. And, these Novices will be different from the Novices who were low-band CW only. They will be more cosmopolitan in nature. Their interests and outlook on the hobby and on *you* as a leader in *their* ham community will be different, because their experiences within the hobby will be much more diversified than anything Novices have experienced in over 20 years.

They will become a voting block to be reckoned with—soon. They will remember who helped them and who didn't. Anyone who has seen the film *Revenge of the Nerds* knows what I mean.

Art finishes his editorial comment by asking why anyone would want to mortgage their own future as a leader of the Amateur community with such an unaccepting attitude to Novices. He gives no answer. If you want to read more of the writing of this rather prolific radio amateur, I suggest you subscribe to his *220-Notes* newsletter. The cost is $5 a year. The address is *220 NOTES*—Subscription Department, c/o Walt Altus WD9GCR, V6539 Birch St. Onalaska WI 54650. Even if you don't operate 220, it's worth it to read what K9XI has to say about ham radio—it's good sense and good reading.

### The Meek Will Inherit Ham Radio

As I said, Art offers no answer to his final question. He came close, but didn't quite hit the mark. Maybe I have—fear. There is fear that, if Novice Enhancement is successful—and there is every reason right now to believe it will be—that the personal or collective power base of younger higher-class licensees may be undermined by the new, and highly politically motivated, Enhanced

Novice. Their egos cannot accept the inevitable; that the success of Novice Enhancement could, by the sheer number of those who obtain licenses, make the United States Novice Class licensee the most politically powerful group in ham radio that this nation has ever seen. So, instead of showing the new Novice due respect, the fear makes him hate. This hate manifests itself in the ways that both Art Reis and I have now detailed.

> ***"Novices represent the future of amateur radio."***

Consider this: about a decade and a half ago, it was said by experts in communications politics that if it were possible to organize all of the CBers then on the air, it would make for a rather formidable political block. It's true that many tried. Some, like HF International, were pretty successful. If CB hadn't lost favor with the public, we might all today be signing "HF Numbers" rather than ham callsigns.

I submit that we had better treat the new Novices with due respect, save someone outside of ham radio comes along and succeeds this time where they failed in the era of CB. The ARRL recognized this. At their July Board of Directors Meeting in Atlanta, they voted to open up a limited number of positions in the field structure to Novice class operators. But, will this be enough? Or will another smart con-man like CB's Rick Cooper and his Communications Attorney Service of the late 1970s come along and build a new amateur radio superpower structure with hundreds of thousands or millions of Novices as its power base? Don't say it can't happen. It's happened in radio many times before, and this story is far from over. And, oh yes. A scary but Happy Hallowe'en from those of us who write the late shift from Los Angeles. ■

# HAMSATS

*Continued from page 69*

ates much more Doppler-induced QRM than anticipated.

Dave WB6LLO reported this mode JA effect to most active F-O-12 operators, but it is difficult to break old habits dating back to early AMSAT-OSCAR-7 days. Perhaps these effects were noticed on AMSAT-OSCAR-8 mode J years ago, but the potential for QRM was low since there were fewer users.

Until further notice, move your receiver while on F-O-12 and move your transmitter while operating A-O-10 to keep the possibility of collisions between QSOs to a minimum. Some adjustments to the receiver are always necessary to keep the other guy in tune, but with practice and patience these operating practices will become second nature.

Procedures for other modes like A, K, and T will not be as much a problem since the frequencies are much lower and Doppler shift and its potential to slide your contact into someone else's is much less. In the future, microwave bands will be employed for some transponders. The possible Doppler shifts may be in the tens of kHz, but, until then, contending with F-O-12 and its needs will be enough.

Mode JD users are reminded that the JD transponder still cycles on and off every two hours. The change-over time occurs when the satellite is within range of Tokyo. Do not expect to see a mode change from JD to JA, or JA to JD, while the satellite is over the U.S.

Last month I mentioned the possibility of mobile contacts via F-O-12. Photo A shows Tom's (N6DGK) system on the road.

While simple whips resulted in many fine RS-10/11 contacts, Tom has experimented with different configurations for chasing F-O-12. Although the small 70-cm crossed yagi cannot be used while in motion, it has other advantages. It is mounted on a camera tripod for quick set-up and easy aiming. Should the desense from the two-meter transmitter become a problem, he can move the 70-cm receive antenna away from the car and continue operation. The small crossed yagi has a broad beamwidth, requiring few adjustments during a satellite pass. Tom

*Continued on page 74*

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### CONTEST RESULTS!

The unofficial results have been tabulated for the 6th annual August 1987 North American USATVS Fast Scan TV DX and QSO Party UHF Contest which was held during the week of August 17th to the 23rd. Scores are being checked for accuracy with the final results to be published in the September/October issue of the Spec-Com Journal.

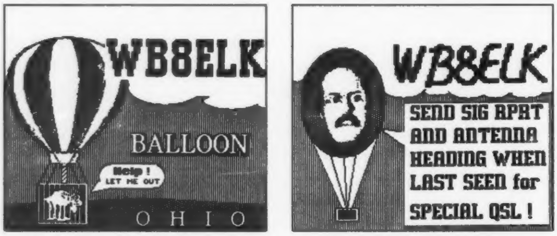
There were a total of three operating contest logging categories that you could enter in from one of three declared locations: Single-op, Multi-op, and Club-op at fixed, remote, or mobile operations. A base score of 100 points was awarded for per-station contacts with at least a P1 locked-up TV video signal. Bonus points were awarded for the reception and transmission of color and audio (4.5 subcarrier, on-carrier, or independent). A DX multiplier existed in ranges of 25-mile increments and a band used multiplier gave extra points to those who used other than the 70-cm band. Special pre-made USATVS Contest forms were available for those who requested them prior to the event. Over fifty were mailed to key ATVers and Section Managers in the USA for local distribution. Rules and guidelines of this contest were published in the June issue of Spec-Com and here in the *73 Magazine* column.

ATV's only contest each year is sponsored by the USATVS. The rules and guidelines for this contest have varied through the years as contest organizers fine-tune this unique special contest to do what they want to accomplish. The main purpose of this contest was to bring out activity during contest week, and organizers agree that this certainly happened. The second purpose of this contest is to recognize those FSTV station operators here in North America who have excelled in building up a long distance, quality home television operating studio on difficult-to-master UHF and above frequencies. This is no easy task: It is far more challenging than mere SSB, FM, or satellite modes operation on the same frequency.

New to this year's event was the allowance of the use of ATV repeaters, with a 50% point penalty. As it turned out, very few contacts were made through repeating devices across the country, but it was generally thought a good idea not to restrict entirely the use of them if contacts were needed to be made through them usually by low power or low-level terrain stations. This procedure will become part of a regular feature in future contests.

### The Winners

First place in the Multi-op category and with the most accumulated points in the nation and North America was the team of W6VCF and K6DFM operating from Malibu, California. Together, they scored a whopping, record-setting 30,951 points! They operated form a motor-home high atop Saddle Peak and made 32 contacts—all done on the last day of the contest. The ranges of many of their contacts direct on simplex were 45–125 miles. Frequencies used were 434, 923, and 1240 MHz. On 434 MHz, they ran 6 Watts into a 48-element J-beam. On 910 and 1243 MHz, they ran 1.5 Watts into a 27-element F9FT. They also used portable power from a Honda EM-600 generator. Only 3 out of the 32 contacts were on an ATV repeater, WA6SVT/R, which is located at Santiago Peak in Orange County at a distance of 70 miles from their station. Both winners have 3-year subscriptions to Spec-Com and framable contest award recognition certificates. The W6VCF team are repeat winners from a past contest and participate each year in the event. Congratulations, fellahs!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Figs. 1 and 2. Computer screens transmitted by balloon package.

In the Single-op category, yours truly took first place with a score of 20,915 accumulated points. I had 29 contacts—again, only three via the ATV repeater, and all on 70 cm. My longest contact was 180 miles. Unfortunately, for us here in the Midwest, there were no band enhancements or openings during contest week. Taking second place was Jim Ryan K9MTE of Woodstock, Illinois. Jim had 16,350 points with 17 contacts. He has been on FSTV for only a few months now, and has really become the most reliable HAM-TV station to work and "see out" the Chicago area. Henry Ruh KB9FO has been running early morning video and talk schedules for some time now and was P2 here in Iowa during the contest. Last year's winner, N9AB, of Ivanhoe, Illinois, was heard only one or two nights. He gave out some pointers, but chose not to work the contest this year.

Competition is getting fierce for once in the Windy City. The Chicago 2-meter accessible Color Weather Radar at 426.25 MHz has been on-the-air now for 6 months and is working just fine. It has been seen as far away as Hebron, Indiana, at times of enhancement at P3–P4 levels. Work continues on the Chicago ATV repeater project, but it has been hampered by its inaccessibility because of the NBC strike at WMAQ-TV.

Third place went to Bill WB8ELK as Single-op ATV mobile! Bill (of Findlay, Ohio), amassed 12,750 points. He completed the delayed launch of the helium-filled balloon (reported below) and then packed up all of his FSTV and 2-m gear and went to Maine for his vacation. During contest week, he travelled and made TV contacts along the way, some even on freeways. On a few, he drove right up to their door! Some notable contacts in New England were W3ZQS, WA3VCR (how is that for a call?), W2OSW, WB2UBR, and KB2CXM. Way to work 'em Bill—the USA's only working ATV mobile for the contest! Were you horizontal with your quad?

Fourth place went to Donald Townsend KE7NR of Chandler, Arizona with 8,925 points. Don reported good activity and enthusiasm in his area and had 18 contacts. Fifth place went to Marty Fitzgerald WD0BCE of Davenport, Iowa, with 8,400 points and 13 contacts. Other Top-Ten finishers include Henry Ruh KB9FO of Des Plaines, Illinois, with 8,175 points; Casimere Pustelnik W2OSW of Buffalo with 6,525 points; Ron Hines WA9NJR of St. Paul, Minnesota, with 5,900 points; John Hegeman WB0BIZ of Bettendorf, Iowa, with 5,800 points; and Don Fuller W2WHK of Tonawanda, New York, with 4,250 points.

There were 23 entries this year. Contest award recognition certificates will be mailed to all stations who entered the contest. Congratulations to all!

### ATV Balloon Launch

The WB8ELK helium balloon experiment was launched on August 15th, at 1:25 p.m. EDT from Findlay, Ohio. The balloon package consisted of a 1-Watt ATV transmitter (PC Electronics KPA-5), a custom-built computer graphics generator in color with two graphic screens timed in sequence, a GLB CW ID module, and a 100-mW 2-m FM transmitter made by International Radio Kits in the early 70s. Power consisted of 10 Polaroid Lithium cells connected to provide 500 mA at 12 volts for approximately 7 hours.

The balloon was a 5-foot weather balloon made by Kaysam and is the same balloon used by the National Weather Service for Radiosonde launches. The balloon system consisted of the balloon, a parachute for recovery, aluminum foil for observation, and radar reflection, and the transmitting package on the end. The two-meter antenna was a 1/4-wave vertical whip, and the 439.25-MHz ATV antenna was an omnidirectional turnstile mounted on the bottom of the package.

The total package weighed in at 2 lbs., 11 oz., and our final lift from the balloon was 2 lbs., 15 oz. This gave only 4 oz. of lifting force resulting in a slower-than-planned ascent of 700–800 feet/minute.

During the launch, the ATV antenna became damaged so that two of the elements on the turnstile were bent downward resulting in deep fades as the package spun around. At 2:59 p.m., at

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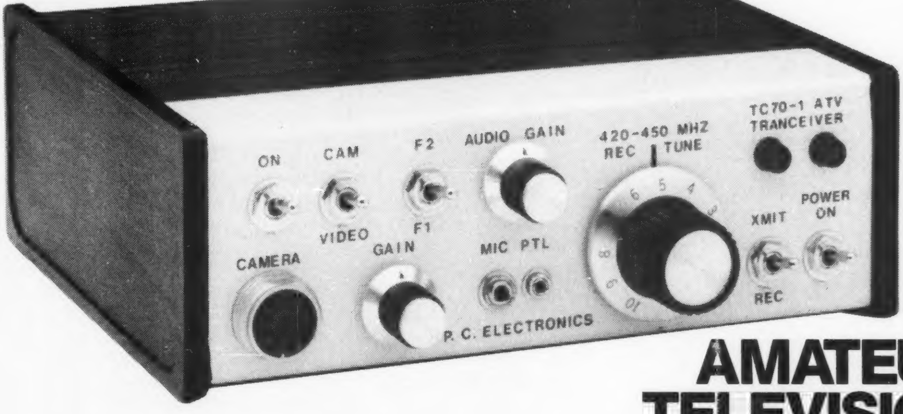

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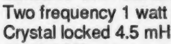

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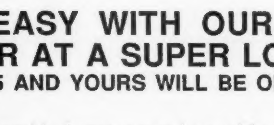

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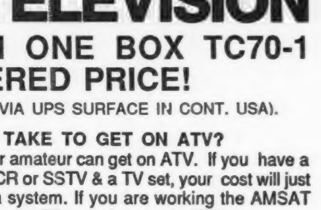

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*Continued from page 72*

about 60,000 feet, the ATV transmitter quit, and the 2-m beacon quit fairly suddenly around six minutes later, at around 70,000 feet. One possible cause of all of this is bursting batteries at the near-vacuum of that altitude. The balloon was followed by Jim WA8VWY in his Cessna shortly after launch, and was able to optically track it until 4:00 p.m., where it was estimated to be at an altitude of 100,000 feet. The ground crew was able to view the balloon with binoculars until 4:30 p.m. with the balloon appearing as a bright star. After that, the balloon moved close to the sun and was lost from view of the ground crew as it slowly drifted westward. Due to very light winds, the balloon stayed within 18 miles for over three hours; but it was never seen again after 4:30 p.m. It's hoped that someone will find it during the fall crop harvest.

The 439.25-MHz ATV signal was received as far away as Buffalo by W2RPO (290 miles), and in Chicago (250 miles) at a P2–P3 level by K9MTE, KB9FO, and others. Stations within 100 miles reported varying signal strengths of between P3–P5 with deep fading, although W8RVH tilted his ATV antenna 45 degrees which eliminated most of the fading. Picture reception reports have been coming in from Ohio, Michigan, Indiana, Pennsylvania, Illinois, New York, and Ontario.

The 2-m beacon was heard as far away as Baltimore (400 miles) by N3AGG, and in St. Louis (400 miles). The 2-m range seemed to follow the radio line-of-sight formula $1.4 \times \sqrt{H}$ while the ATV range seemed to approximate the optical line of sight formula $1.2 \times \sqrt{H}$. H is height in feet.

An interesting phenomena occurred within three minutes of launch at about 2,500 feet, when the balloon passed through an inversion layer and produced reception in Cleveland, Pittsburg, Detroit, and Canada, of a strong 2-m beacon and ATV picture for about 1 minute. Band conditions were interesting indeed as WA8SAJ in Cleveland (125 miles) reported hearing both signals as the package was activated several minutes prior to launch at an altitude of three feet off the ground. WB9FOL received the beacon 8 seconds after launch at a distance of 110 miles.

Bill WB8ELK thanks all who assisted him with this project, and in particular WA8HDX for the use of his barn, WA8VYW for his excellent airplane tracking, WB8MSJ for working out the balloon-filling procedure, KA8LWR and WA3USG for their fine job in coordinating the 40-m information net, W8VKR for his equipment donations, Spec-Com and WB0QCD for donating the ATV antenna and solar cells for balloon II, W6ORG of PC Electronics for his technical support, and finally the valiant efforts of the chase team of N8DOO, WA8GAU, W8RSK, NR8Q, and KA8WLV. Any group capable of looking through binoculars at a tiny speck in the sky for hours while lying in a ditch filled with poison ivy has to be dedicated!

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## Hamsats

*Continued from page 71*

runs 80 Watts on Fuji's two-meter uplink and has two GaAsFET preamps available for the 70-cm downlink.

### RS-10/11

More details on the antenna configuration of our newest hamsats are now available. As reported in the September column, RS-10 and RS-11 are part of a larger Soviet spacecraft, COSMOS 1861. Four antennas on the structure are used for the amateur radio satellites. RS-10 and RS-11 each have their own two-meter, half-wave verticals, but the other two antennas, a ten-meter ground plane, and a 15-meter ground plane, are shared between the two units.

I have received requests for a new RS-10/11 frequency chart. The April column presented a preliminary offering for RS-9 and RS-10. This chart from Ron WA5RON has been updated and is shown in Figure 1. The graphic presentation is much easier to use than a table of frequencies.

For most satellite enthusiasts, desense has been a major problem for serious mode K operation, which uses 15 meters up and 10 meters down. Two interim solutions can get you on the air until the problem can be completely cured.

The first is to choose a downlink frequency several kHz away from other stations. Using the chart in Figure 1, or the table shown in the September column, calculate an uplink frequency to match with the downlink receive frequency you are monitoring. Call CQ even though you cannot hear yourself through the satellite due to the desense problem. Since calling in the blind might put you on top of another QSO, it would help if a friend could monitor the downlink to see if your calculations are correct.

The second method is to have a friend not only monitor your downlink, but also to relay it back to you. This can be done either by phone, via two-meter FM, or, for the Novices, 220 MHz FM. Two hams in Houston, W5BKK and KE5IC, have tried this quite successfully with mode K Robot operation.

### AMSAT-NA Technical Journal

A new publication is now available from the Radio Amateur Satellite Corporation. The Amsat-NA Technical Journal, or just "ATJ", was created to publish papers reporting findings in the field of low-cost satellite design, construction, and operation.

The first issue, available from AMSAT-NA for a donation of $10, plus $2 postage and handling, is 45 pages long, printed on quality paper, and contains no advertisements. Some of the papers are quite technical, but as Editor Bob Diersing points out, in order to achieve personal advancement in a technical field, it is necessary to study material that may be far beyond your level of experience at the time. Figures, tables, schematics and other illustrations are prominent in "ATJ". Give this one serious consideration for inclusion in your hamsat library.

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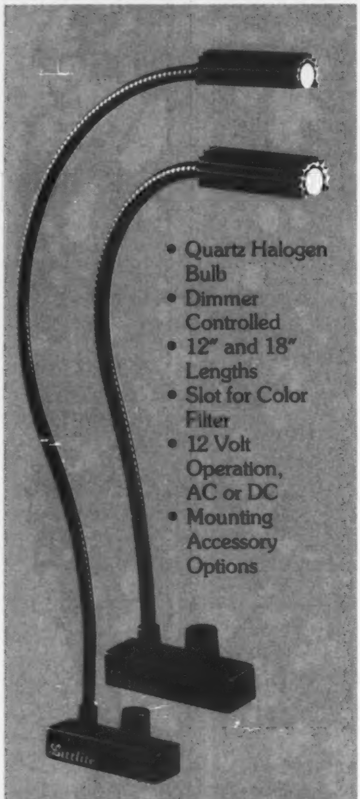

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# DX

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### The XF4DX Revillagigedo DXpedition

Has the one-man DXpedition gone the way of the spark gap and coherer? The traditional DXpeditioner was a single operator hopping from place to exotic place, working the multitudes, and moving on. Danny Weil, Gus Browning, Don Miller, and others refined the art of DXpeditioning, now followed by a small minority of DXers. Eric Sjoland SM0AGD and San Hutson K5YY, and, of course, Lloyd and Iris Colvin W6KG and W6QL follow these hallowed footsteps around the world.

But recent years have seen the advent of the luxury DXpedition. The recent Clipperton trips demonstrated that enough DXers with sufficient funds can activate some of the rarest islands in the world in relative comfort and safety. Rather than sailing their own boat, or relying on local, unscheduled means of transportation, the Clipperton crew and others have chartered a large, comfortable yacht and avoided the problems that plagued earlier Clipperton DXpeditioners.

The February XF4DX DXpedition to Revillagigedo was another example of a high-tech (and expensive) approach to operating from rare locations. Five amateurs from the US and Mexico chartered a Grumman G-1 twin-engine propjet (for almost $17,000) to spend a few days operating from this Pacific island.

### The DXpedition Begins

The group assembled in Midland Texas, where Tiger Charter helped the amateurs load more than 3600 pounds of gear, food, and supplies into the plane. After a stop in Baja, Mexico, to pick up XE1IKP, the group winged the 450 miles west to Socorro Island, the largest of the Revillagigedo chain of volcanic islands. They anxiously circled the small landing strip, remembering the last Palmyra DXpedition that crashed on the broken runway on that remote spot. They were prepared to turn back and cancel the DXpedition if the field looked dangerous. Fortunately the field was clear, and soon the plane rolled to a stop on a paved parking ramp.

*Photo A. With their destination a thousand miles from the nearest Radio Shack, XF4DX DXpeditioners K9AJ, K9VV, K4UEE and W0RLX (from left) review their equipment list one more time before packing. (WA8MAZ photo)*

The DXpeditioners immediately began unloading their gear, and started to set up the operating positions and antennas. Two Cushcraft A-3 tribanders went up on push-up masts, with only one minor problem. In their hurry to leave, the amateurs lacked time to pre-assemble and test the antennas. When they opened the box, they discovered that the center insulator of the driven element was missing. In the spirit of DXpeditioners everywhere, they sawed off part of a broom handle, and put the antenna on the air.

For 160 meters they erected a Minooka Special (see May 1974 QST for details). The antenna performed splendidly, and helped provide many Top Band Dxers with an XF4 contact. An inverted L for 80/75 meters and an inverted vee for 40 and 15 meters completed the antenna farm. Unfortunately, every tree in the vicinity of the airport had long since been converted into firewood, and antenna supports taller than knee-high were sadly lacking. Still, the simple antenna assortment worked well, especially into Europe, where XF4 ranked 21st on The DX Bulletin's 1986 most-wanted-countries list before the XF4DX trip.

*Photo B. Nearly two tons of radio gear, antennas, food, and supplies await departure.*

Rigs included Drake twins, ICOM and Kenwood transceivers, and a Drake TR7, followed by Alpha and other amplifiers. For electric power, the XF4DX DXpeditioners packed three Yanmar diesel generators, totalling almost 9 kW of available power. The generators ran well on jet fuel, siphoned from the tanks of the Grumman G-1. As soon as the first station was connected up, XF4DX was off and running.

The operation proceeded smoothly for a time, until some of the mainland Mexican amateurs voiced doubts about the group's legal status to operate on the island. To avoid conflicts, the XF4DX group elected to shut the station down for a time, until matters could be resolved to everyone's satisfaction. Unfortunately, this shut-down coincided with a holiday in Mexico, adding an extra day to the delay in re-activating XF4DX.

After a tour of the island, including a hike to the summit of the 1130-meter high central moun-

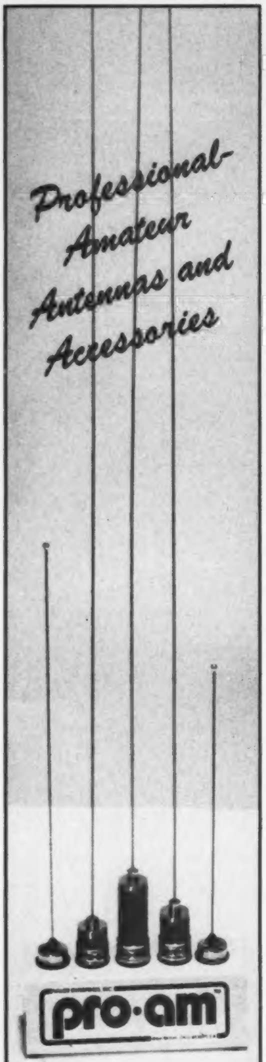

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*Photo C. At about $2 per QSO, the XF4DX trip may well deserve the dollar signs on their chartered Grumman G-1 propjet.*

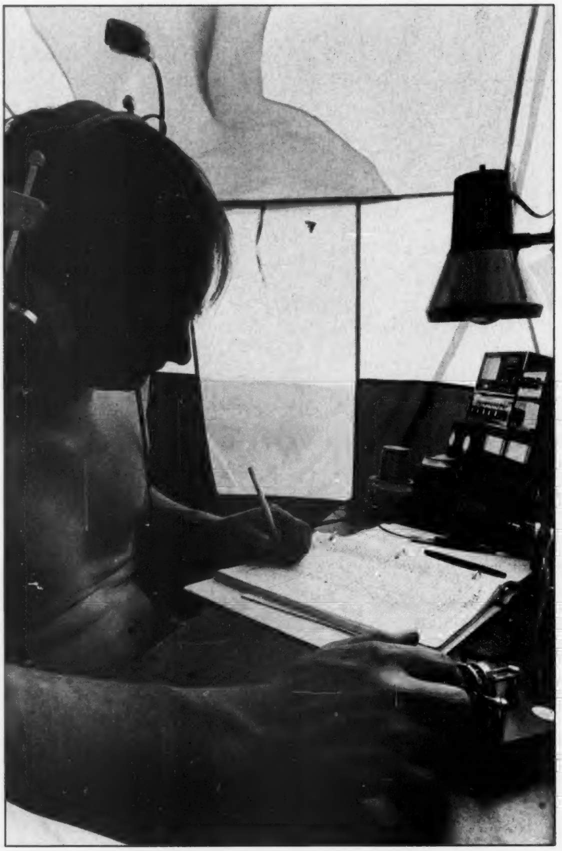

*Photo D. K9VV hammers out 40 meter CW contacts as XF4DX, from Sorroco Island.*

tain, the group resolved the minor differences of opinion, and the XF4DX was on the air again.

**See It On Video**

Living conditions were primitive but adequate on the airport parking ramp. The group siphoned water from the airplane's tanks, as well as fuel for the generators. One evening, however, a strong Pacific storm sent rain sheeting into the tents. At one point, more than an inch of water sloshed back and forth in the bottom of the tent, where power leads hung carefully suspended above the high water mark.

Soon (all too soon, given the interruption in operating), the group had to dismantle the gear, pack the plane, and head back to the States. However, as the veteran pilots prepared the aircraft prior to takeoff, they noticed a split hydraulic line that would leak out all fluid, and thus cut off all controls, long before the plane could reach the mainland.

The pilots conferred, and decided to switch lines with the hydraulic tubing that controlled the landing gear. Since that line is only used at takeoff and landing, the small leak wouldn't drain the fluid supply. They hoped.

Fortunately the flight back to Cabo airport was without incident, and the plane landed safely in Baja, where replacement parts awaited their arrival. The DXpeditioners, after a week without showers and four days without a cool drink, raced for the bar, where they soon found themselves alone, despite the extremely crowded airport!

Their problems didn't end with their return home, as the authenticity of the trip was challenged, threatening DXCC credit for the contacts. Again, the misunderstanding was quickly resolved, and XF4DX was accepted for DXCC credit in early June.

The group's problems limited actual on-the-air time to only 93 hours, but the dedicated DXpeditioners made the most of their time, and logged 15,110 QSOs, or 166 per hour! CW contacts outnumbered SSB contacts 8700 to 6400, with many European and more than 2000 Japanese QSOs included.

Operators on the trip were K9AJ, K9VV, W0LRX, K4UEE, WA8MAZ, and XE1IKP. Others assisting included XE1ALD, XE1JAK, and many more. The operators even put together a VHS videotape of their experiences, which is available for $20 postpaid from Don Daso WA8MAZ, Route 1 Box 246, Mt. Holly NC 28120.

Clipperton boasts a serviceable landing strip, as do many relatively rare DXCC islands. The XF4DX crew showed that a small group of dedicated DXers can activate a rare one with some time, planning, and plenty of money. A DXpedition to Baker/Howland Island KH1, for example, lacks only a handful of DXers who have a few weeks and several thousand dollars each to spare.

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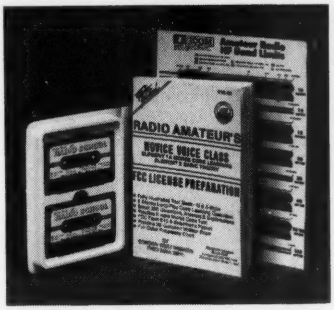

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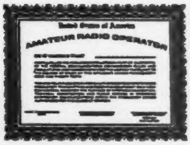

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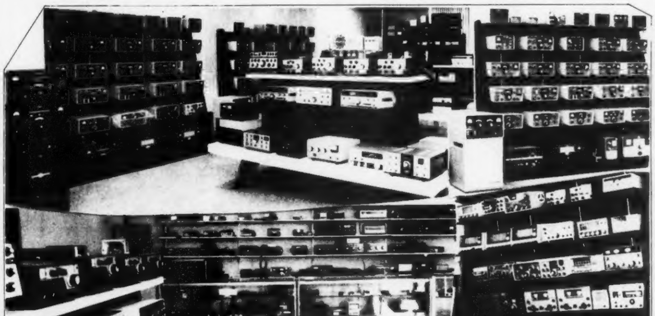

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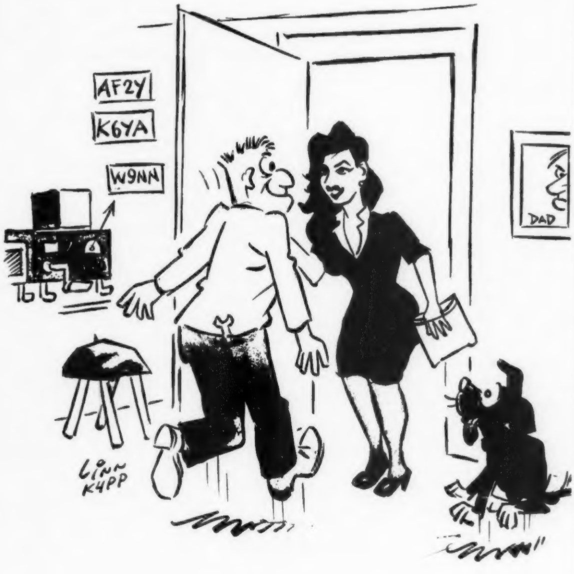

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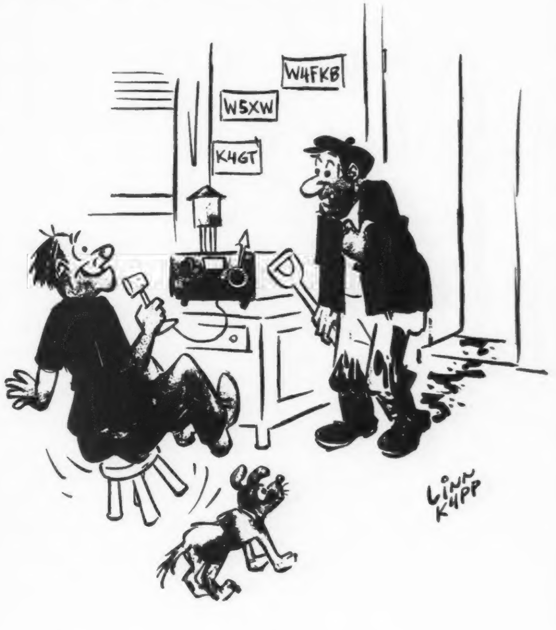

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# AERIAL VIEW

## Antenna Update

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### BROADBAND 80m ANTENNAS

Eighty meters is one of our most popular HF bands. It's also our widest in percentage terms. This latter point can cause difficulties if you enjoy operating at both ends of the band but are using a coax-fed single-wire dipole and a typical solid-state transceiver. The problem that arises is that the ordinary 80-meter dipole is too narrowbanded to present an swr of 2:1 or less over a bandwidth of 500 kHz. Therefore, your transceiver output begins of fold back as you stray very far (typically more than ±125 kHz) from the resonant frequency of the antenna.

One solution is to use a transmatch to couple the transceiver to the antenna system, but doing so compromises your ability to make rapid frequency excursions with your no-tune transceiver. Another possibility is to replace that single-wire dipole with a broadbanded antenna. What follows are some examples of relatively simple broadbanded antennas that will allow you to operate over most, if not all, of the 80-meter band while using a coaxial transmission line and no tuner.

Two dipoles mounted at right angles to one another and cut for opposite ends of the band (Figure 1) can produce a broadbanded response. Logan claimed an swr of 2:1 or less from 3.5 to 4 MHz for such an antenna, with dipole 1 resonant at 3.56 MHz and dipole 2 resonant at 3.94 MHz.[1] If you have the room to mount two 80-meter halfwave dipoles at right angles to one another, this is an easy way to improve the swr bandwidth of your 80-meter antenna system.

A somewhat similar wideband antenna credited to ZS6ZO uses two dipoles cut to the center of the band and fed 90 degrees out of phase from one another via a quarter-wavelength phasing line (Figure 2).[2] Once again, the two dipoles are mounted 90 degrees apart. The reported bandwidth with this antenna was approximately twice that of a single dipole alone, thereby covering most of the 80/75-meter band.

What is probably my favorite in this class of antennas is one that's been around for a long time: the cage dipole (Figure 3). This uses several wires to simulate a conductor of large diameter. Increasing the conductor diameter produces an antenna whose reactance (and swr) varies less with changes in frequency than it does with a "skinny" antenna.[3] The increased diameter also means that these antennas are shorter than a single-wire dipole tuned to the same frequency. For instance, a cage dipole that I used for a number of years had 4 conductors spaced 2 feet apart and was 117' long. Mounted 80 feet above ground, it was resonant at 3800 kHz and provided a 2:1 or better match across the band. Harbach, using a 115' antenna with 4 conductors spaced approximately 4 feet apart, reported similar results.

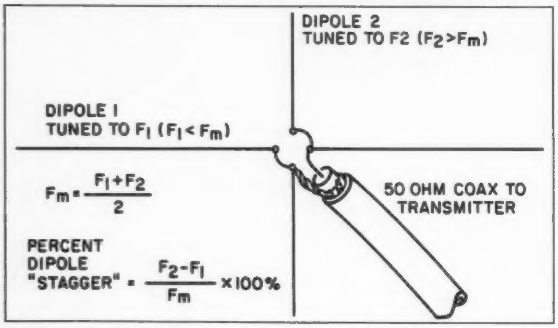
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*Fig. 1. Top view of the broadband stagger-tuned, crossed dipole antenna.*

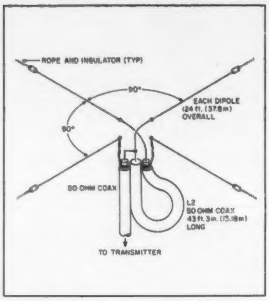

*Fig. 2. The 80m wideband antenna at ZS6ZO. Two dipoles spaced 90 degrees apart are fed 90 degrees out-of-phase with an electrical quarter-wavelength interconnecting line. Shields of lines are all soldered together at dipole feedpoint and connected to adjacent antenna sections.*

When assembling a cage dipole you must make allowance for the increased wind area relative to an ordinary dipole—you now have 3 or more wires plus spreaders—so plan accordingly when choosing wire and insulators. I used #14 wire for my antenna, and experienced no mechanical failures. The spreaders were fashioned from some Plexiglas™ that I had on hand at the time. However, they could be made of wood or PVC. Conductors such as angle aluminum have also been used for spreaders, although some claim that doing so increases the antenna Q and hence markedly decreases bandwidth.[5]

Attempting to erect a cage dipole in an area cluttered with underbrush and overhanging limbs can be a nightmare (trust me, I've tried it), but if you can suspend one wire near ground, build the remainder of the antenna around that wire, and then pull the complete assembly into position, the task is not especially difficult.

Another dipole cousin is the fan dipole.[6] As can be seen in Figure 4, each side of a fan dipole consists of two arms 55 feet long, spaced 12 feet from one another at the ends, and joined at the center. The antenna is 110 feet long, causing it to have a capacitive reactance on 80-meters. To compensate for that reactance, a reactance of opposite sign (i.e., an inductor) is connected across the antenna terminals (see Figure 4 for details). This procedure also transforms the resistive component seen at the antenna to approximately 50 Ohms.

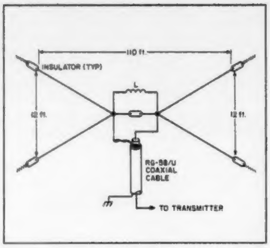

*Fig. 4. Broadband fan dipole for 80m. Wires may be either in the horizontal or vertical plane. The inductive reactance ($X_L$) is 64 Ohms. At 80m, L = 2.7 uH; this is achieved by winding 8-1/2 turns of #12 wire around a 2"-long, 2"-diameter tube.*

W7IS, has his own version of a wideband dipole for 80-meters (Figure 5).[7] As you can see in the illustration, he uses five equal length wires connected in parallel for each leg of the dipole. The wires are spaced approximately 2 feet apart, with no spreaders being used. W7IS claims an swr of less than 2:1 over the 80-meter band with this antenna. Although he used a 1:1 balun at the feedpoint of this antenna, I suspect that it would work equally well with direct coax feed.

The discone and conical monopole (Figures 6 and 7) are two wideband vertically-oriented antennas that not only covers all of the 80/75-meter band with a low swr, but works well over several adjacent amateur bands. Their shortcoming is that they take up considerable real estate when designed for the lower HF bands. Due to their limited application, interested readers are referred to the ARRL Antenna Book (edition 13) and an article by Stan Gibilisco W1GV/4 in the May 1985 issue of *73* for further details.

The antennas discussed above certainly do not constitute an exhaustive list of the wideband antennas that can be used on 80-meters. However, they do provide some examples of how you can erect an antenna that yields a relatively low swr over the

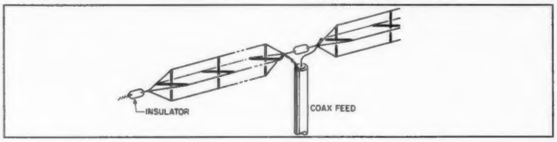

*Fig. 3. Cage dipole. The spreaders are spaced at 10-15' intervals.*

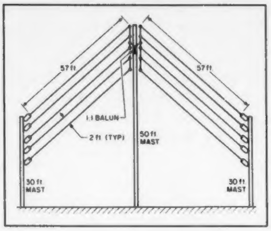

*Fig. 5. W7IS's 80m wideband dipole.*

3.5 to 4-MHz range. And don't forget that these antennas can also be scaled for use on the other amateur bands that have relatively large bandwidths, such as 160 and 40 meters. So, give one of these antennas a try and free yourself from antenna-tuner slavery. I'm interested in hearing how they work for you and what new ideas readers have for these (and other) antennas. ■

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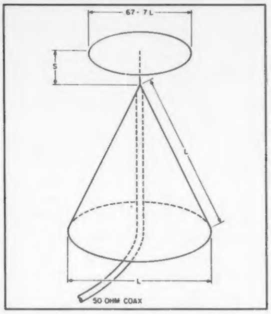

*Fig. 6. Discone antenna. L = wavelength/4 (free space) at lowest operating frequency. S = 1-6 inches.*

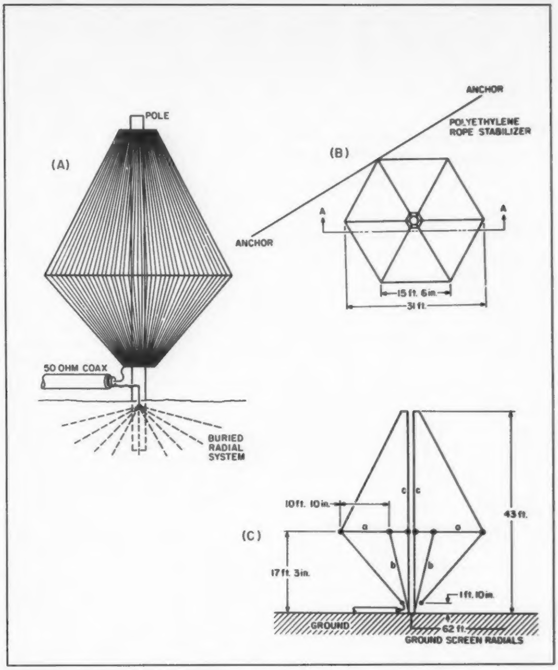

*Fig. 7. The conical monopole antenna. At B, top view shows the dimensions for 3.5-14 MHz. At C is shown the side view of the conical monopole at section A-A. Note that the grounding stubs, b, connect to the short radial wires, a. Wires c run up the sides of the supporting pole, which is unguyed.*

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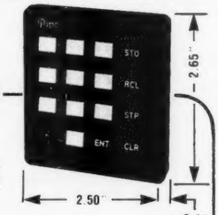

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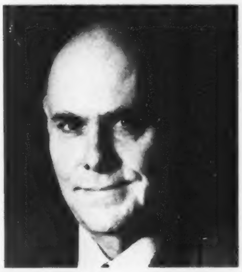

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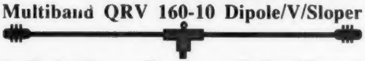

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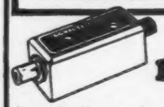

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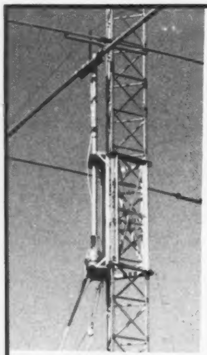

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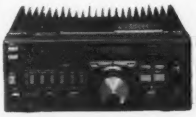

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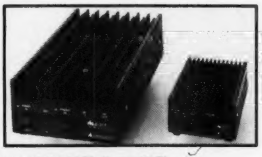

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# SPECIAL EVENTS

*Ham Doings Across the Country*

### CHICAGO IL
### OCT 31–NOV 1

The A.R.R.L.'s Central Division is having its 1987 convention as part of a "Hamtastic Weekend" sponsored by one of the country's oldest clubs, the Fox River Radio League. The event will be all under one roof in the spacious Norris Sports Center just off Rt. 64 in St. Charles IL. The site is about 35 miles west of Chicago. All events including a flea market are fully accessible for wheelchairs.

This is the second consecutive year that the Central Division has been part of this popular hamfest. In addition to commercial exhibits and sales there will be an indoor flea market and many forums, seminars, and technical demonstrations. Exams will be given for all classes of licenses.

The hamfest/convention hours are 8 a.m. to 2 p.m. both days, Saturday and Sunday, October 31 and November 1. Sellers may set up 7 p.m. to 9 p.m. Friday, 6 a.m. Saturday, and 7 a.m. Sunday. Tickets good for both days are $3 in advance and $4 at the door. For advanced tickets or information on tables or exams, contact Phil Fors N9FXQ, 104 May Street, West Chicago IL 60185, or phone 312/231-8841. A SASE will be appreciated. Talk-in will be 145.47 (-600) and 145.21 (-600).

### GRAYSLAKE IL
### NOV 1

Waukegan C A P will hold its 7th annual hamfest at the Lake County Fairgrounds, Rts 120 and 45, Grayslake IL on Sunday, November 1, 1987, from 7 a.m. to 5 p.m. Large indoor flea market, cafeteria, free parking. Tables $5, donations $3. For reservations and information send a SASE to CAP, 637 Emerald St., Mundelein, IL 60060.

### SELLERSVILLE PA
### NOV 1

The RF Hill Amateur Radio Club, serving the Bucks and Montgomery County areas of Pennsylvania, will hold its 1987 hamfest on Sunday, November 1, 1987 at the Pennsylvania National Guard Armory, PA Route 152, Sellersville, PA.

Doors open at 6 a.m. for sellers, 8 a.m. for the general public. Entry is $4, accompanying spouse and children are free. This year there is expanded space both indoors and out due to a recently completed improvement project at the Armory.

Indoor space will be $8, and outdoor will be $6. Talk-in on repeaters at 145.31, 145.19, 146.88 and 146.52 simplex. To reserve space write: Hamfest Chairman, 523 Vine St., Perkasie PA 18944.

### SOUTHFIELD MI
### NOV 7

AMSAT, Radio Amateur Satellite Corporation is holding its 5th Annual General Meeting and Space Symposium on Saturday, November 7, 1987 in suburban Detroit at the Southfield Hilton. Featuring Dr. Tony England W0ORE, Shuttle Astronaut and Space Station Program Scientist. There will be a banquet, lectures, seminars and tutorials, displays and exhibits, live demonstrations, sessions for beginners and novices, handouts and other literature. For additional information and registration forms write to: AMSAT, PO Box 1091, Ann Arbor MI 48109-1091.

### LOGAN WV
### NOV 7–8

The Logan County ARC will hold its seventh annual "Mountain State Award" expedition from 1600 UTC November 7 until 0200 UTC November 8. The call sign will be NU8K. Operations will take place on a West Virginia mountain-top in Logan County, which is located in the heart of southern West Virginia's billion dollar coal fields. The phone operating frequencies will be approximately 25 kHz from the low end of the general phone bands as propagation allows.

A handsome 8″x11″ certificate will be awarded to all contacts submitting a QSL and legal size SASE to: Roy Elkins NU8K, PO Box 202, Monaville WV 25636.

### HINES IL
### NOV 8

In observance of Veteran's Week, members of the Hamfesters Radio Club, Chicago, will operate from the Hines V.A. Hospital's Robert K. "Pappy" Wade K9CDH Memorial Ham Shack using the Hine's club call K9WFN from 1500Z to 0300Z, Sunday November 8. The club will operate on 40 meters, 20 meters, 2 meters FM and 2 meters USB. Frequencies to be used are 14.260, 7.260, 146.43 simplex, 144.210 USB. Please send QSL, QSO number and a 9x12-inch SASE with $.39 postage or $1 to: Hamfesters Radio Club, Chicago, %Robert K. "Pappy" Wade Memorial Ham Shack, Bld. 8, Hines Veterans Administration Hospital, Hines IL 60141 for a commemorative certificate.

### FORT WAYNE IN
### NOV 8

The Allen County Amateur Radio Technical Society will present the 15th Annual Fort Wayne Indiana Hamfest on Sunday, November 8, 1987 at the Allen County Memorial Coliseum on Coliseum Boulevard (U.S. 30). 450 tables available, all indoors. Dealer setup begins 5 a.m. Doors open 8 a.m. to 4 p.m. General admission $3.50 advance, $4 at the door, children 11 and under free. Tables $10 each. Premium $25 each. Plenty of parking on paved lot. Women's activities in a new, larger area. Forums. Talk-in on 146.28/.88. Motels and restaurants nearby.

VE examinations given Saturday, November 7th with advance registration only. For more information on reservations contact AC-ARTS HAMFEST, PO Box 10342, Fort Wayne IN 46851. For information ONLY, contact Bernie Holm K9JDF, Hamfest Chairman at 219/485-0164 between 6 p.m. and 10 p.m. EST

### MILWAUKEE WISC
### NOV 14

The Milwaukee Repeater Club is proud to sponsor the 3rd annual "6.91 Friendly Fest" on Saturday, November 14, from 8a.m. to 1 p.m. (sellers admitted at 7 a.m.), at the newly-expanded Serb Hall, 51st and Oklahoma Ave. The selling halls will be located entirely on the ground floor with easy access so, rain or shine, gather up your swapfest bargains and come share our famous Milwaukee hospitality. Tickets are just $3, tables are $4. To save $1 per ticket or table—send SASE with payment to The Milwaukee Repeater Club, PO Box 2123, Milwaukee WI 53201, before November 7. Talk-in on 146.91- (The Friendly Repeater) and on 146.52. On-site Amateur Exams.

### MONTGOMERY AL
### NOV 14–15

The Montgomery Amateur Radio Club will host the 10th Annual Central Alabama Montgomery hamfest at the Ed Teague Arena at the Central Alabama State Fairgrounds near the Coliseum. Free admission, free parking, plus overnight RV parking with hookup ($5/night). Flea market and dealer set-up available Friday night 7 p.m. to 10 p.m. and beginning Saturday and Sunday at 6 a.m. Tables are $5 each day or $7 each for both days, reservations are not required. Doors open to the public from 9 a.m. to 4 p.m. Novice through Extra Class FCC license exams both days beginning at 9 a.m. Bring a copy of current license for upgrades. Talk-in information on 146.24/84, W4AP/RPT. Other local repeaters available on 147.78/18, 449.50/444.50 and 146.32/92 with autopatch. For more information write to: Montgomery Hamfest at PO Box 3141, Montgomery AL 36109 or call Randy at 205/832-4598 or Ken at 205/271-0028.

### NORTH HAVEN CT
### NOV 15

SCARA indoor ham radio and computer flea market. Sunday, November 15, at the North Haven Park and Recreation Center, 7 Linsley Street. Sellers admitted at 7 a.m., buyers from 9 a.m. to 3 p.m. Tables are $10 in advance, $15 at the door. General admission $2 per person. Talk-in on 146.01/.61. Reservations for tables must be received by phone. For information or reservations, SASE to: SCARA Flea Market, PO Box 81, North Haven CT 06473, or call between 7 p.m. and 10 p.m. Brad at 203/265-6478.

### ROCKFORD IL
### NOV 15

The Rockford ARA and Experimental ARS will sponsor the 1987 Rockford Hamfest/Computer Fair in conjuction with the Illinois State ARRL Convention, to be held at the Forest Hills Lodge, 9900 Forest Hills Rd., on November 15 from 8 a.m. to 4 p.m. Features ARRL forums, radio and computer technical programs, VE exams, dealers, flea market. Free parking. Wheelchair accessible. Admission $3 in advance, $4 at door. $5 for indoor flea market tables, $2 outdoor tailgating. Talk-in 146.01/61 and 146.52. Contact: Roger Sawvell KD9MQ, 6514 Swansdown Drive, Rockford IL 61111 (815/282-1283).

### BILLERICA MA
### NOV 21

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CIRCLE 150 ON READER SERVICE CARD

Radio Association, sponsor of 146.04/64 repeater will hold their annual amateur radio and electronics auction on Saturday, November 21 at the Honeywell Bull plant, 300 Concord Road, Billerica MA Exit 27 off Route 3. Snack bar and bargain parts store. Doors open at 10 a.m. Free admission and parking. Talk-in on both repeaters. For more information contact Doug Purdy N1BUB, 3 Visco Road, Burlington MA 01803.

### GREENSBORO NC
### NOV 21–22

The 7th annual Greensboro, North Carolina Hamfest, sponsored by The Mark IV Radio Club. November 21 and 22. Franklin Blvd. - National Guard Armory, 9 a.m. to 5 p.m. Tickets $4 in advance, $5 at gate. New tailgate area - price of ticket plus $2 per space. Walk-in FCC exams. Free shuttle bus to largest shopping mall on the East Coast - Saturday. Information and registration: Fred Redmon N4GGD, 3109 Goodall Drive, Greensboro NC 27407 - Phone: 919/852-9244. Tickets Only: Henry Hughes KA4LPA, 2811 Gwaltney Road, Greensboro NC 27407. FCC exams: Hugh Brunson AE4N (919/852-1087).

### ORMOND FL
### NOV 21–22

In celebration of the annual Birth Place of Speed text1 Commemoration and Gaslight Parade, the Daytona Beach Amateur Radio Association will operate K4BV from 1 p.m. to 8 p.m. November 21 and 22. Operation will be in the novice bands and lower 25 kHz of the general phone bands, 147.150 2 meters and packet with digi 904DAB. For special certificate after contact, send SASE to: DBARA, PO Box 9852, Daytona Beach FL 32015.

### WEST PALM BEACH
### NOV 21–22

Palm Beach Repeater Association presents the First Annual Hamfest '87, Amateur Radio and Computer Show. Starting on November 21 at 8 a.m. to 5 p.m. and on the 22nd at 8 a.m. to 3 p.m. , it will be held at the South Florida Fair Grounds, Southern Blvd., (State Rd. 80), in West Palm Beach, Florida. There will be the latest in commercial exhibits, FCC exams, swap tables and a QCWA Luncheon. The talk-in frequencies will be 146.52/.52 (PBRA: 147.165/.765).

For table and/or RV reservations information, write to Hamfest, PO Box 461, Lake Worth FL 33460. (Cutoff date Oct. 31)

### ST. PETERSBURG FL
### NOV 21–22

On Saturday and Sunday, November 21 and 22, the new St. Petersburg Hilton and Towers will be the site of the South Florida ARRL Suncoast Convention sponsored by the Florida Gulf Coast Amateur Radio Club Council. There will be a huge flea market and commercial booths all indoors. Amateur exams will be administered at the convention Saturday the 21st. Frank Butler W4RH, Southeastern Director ARRL will participate in the convention activities. Also on Saturday there will be the usual QCWA noon luncheon. Interesting programs are planned with technical talks and demonstrations of the latest methods of amateur communications. There are also planned club and traffic net get-togethers.

Registration tickets will be $4 until November 13th after that $5 at the door. Make checks payable to FGCARC and mail to 1556-56th Ave., No. St. Petersburg FL 33703. Hilton and Towers rooms will be $60, write or call Hilton and Towers, 33 1st Street, So. Street, St. Petersburg FL 33701 or phone 813/894-5000 and mention the convention. (Do not use the 800 number) There will be unlimited parking at the hotel and nearby.

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455KHz IF for R820, TS830/930/940 . . . . . . . . . . Reg. $110
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Matched Filter Pairs for Above . . . . . . . . . . Reg. $170 pr.
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8.2MHz IF for FT-102, FT-757/767.
Bandwidths Available: ★250, 500, 2100Hz
454KHz IF for FT-102 ( ★250, 500Hz) . . . . . . . . Reg. $75
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BWS: 250, 500Hz, 1.8, 2.1, ★2.4, 6.0KHz
10.76MHz IF for all but 980: BWs: 2.1, ★2.4KHz
455 IF for FT980 only: BW ★2.1KHz . . . . . . . . Reg. $110
455.8 IF for FT-980, FT726: BW ★500Hz . . . . . Reg. $ 75

9.0MHz IF for Tempo I (or FT-200), FT-301, FT-7/B
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# QRP

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### TWO-FER CONSTRUCTION

At the 1986 Dayton Hamvention, the QRP ARCI (Amateur Radio Club, Inc.) and members were so impressed with GM3OXX's "oner" that we also organized and constructed a club project. Mike Michael W3TS and John Collins KN1H volunteered their skills in designing, testing and producing an easy-to-build transmitter. The club set these criteria: 1. The project must be easy to build 2. No special "NASA"-type parts are to be used 3. Small size 4. A contest chairman to organize an on-the-air event using the club's project. When the meeting was over, enthusiasm was running high with all those that attended.

John and Mike, joined by myself and others, did most of the design work over the air. In a few months, the "Two-Fer" was born.

In keeping with the club's guidelines, here is a project for the first-time builder. There are no special parts. A PC board is available (more on that later), but the so-called "ugly" construction works just fine. The transmitter has an output of about 2 Watts; more than enough for coast-to-coast operation. While the Two-Fer is crystal-controlled, the crystal's frequency can be shifted via the on-board vxo. So gang, it's time to get the soldering iron out again!

### The Two-Fer

The Two-Fer is really both a transmitter and a direct-conversion receiver. With correct packaging, the entire project will almost fit into a two cubic-inch space. In this column, we'll look at only the transmitter side.

The schematic of the transmitter is shown ... Figure 1. A Pierce oscillator is used. Aside from its obvious simplicity, it is used because it doesn't have parallel capacitance. This means that the variable capacitor on the gate will change the oscillator frequency from about 4 kHz on 80 meters to 15 kHz on 20 meters.

As with most vxo systems, the amount of swing will depend greatly on the type of crystal used. In almost all cases, the old dependable FT-243 will *not* work. They will, of course, oscillate, but you'll find you can't swing their frequency by much. Best results come from the HC-17/U- and HC-32/U-type crystals.

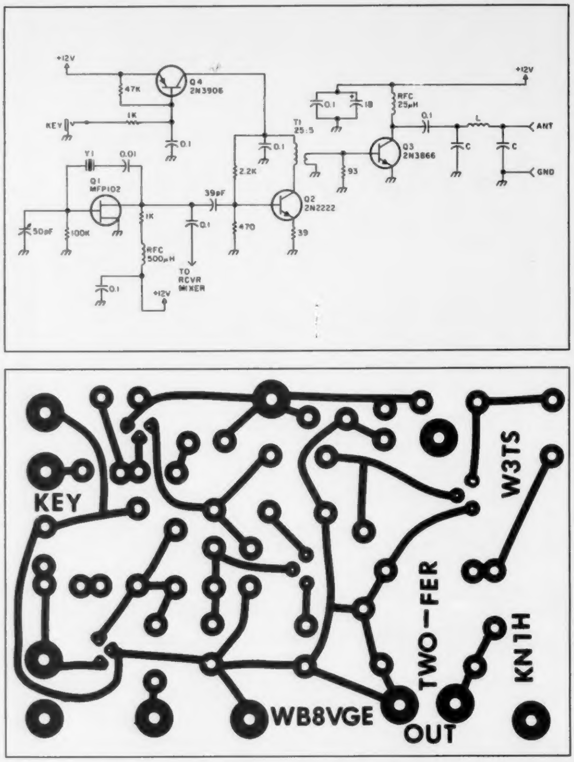
The rfcs are not especially critical. The oscillator choke can be any value from 100 uH to 1 mH. The PA choke can be made by winding 24 turns of #24 wire on an FT-37-61 core. Radio Shack sells a 10-uH choke that works super for the PA.

Raid the junk box for the transistors. The PA transistor may be hard to find. The 2N3866 is the most common, but this device is really too "hot" for the Two-Fer. This transistor will work extremely well at frequencies around the UHF band, but sloppy construction will cause the 2N3866 to oscillate in that band, causing all types of TVI. Left uncontrolled, the device will have a short life.

I find it is best to use the 2N3553. I have used the PA transistors from scrapped CBs and have had extremely good results. The pin out of the board will not match those of the TO-220 case transistor, but you can always bend the leads to fit. No matter what transistor you finally decide on for the PA, be sure to heat-sink it, as they will run warm.

The transformer is constructed by winding 25 turns of #24 wire on a T-50-2 core. The secondary is 5 turns wound over the primary.

Because of the broad-banded nature of the Two-Fer, testing is quite simple. After checking your work over for wiring errors, connect a dummy load to the output. Disconnect the external vxo capacitor for the time being, as extra capacitance may keep slow crystals from operating. Install crystal and key. Apply power and key down. Notice that we have nothing to tune. You should see about 1-1/2–2 Watts, depending on the supply voltage, crystal and band used. If you have access to a frequency counter, lightly couple some rf into the counter. The crystal's frequency should be read. Power down and connect up the vxo capacitor. Power up, and this time monitor the counter. As the vxo capacitor is turned, the frequency should swing. With the counter you can tell just how much swing you will get from that crystal. Use your station receiver to monitor the output of the Two-Fer.



*Figs. 1 and 2. Schematic and PCB layout for the Two-Fer transmitter.*

### Covering the Bands

Up to now, I made no mention of bands covered. Well you have a choice! Table 1 shows all the values for the output filter. Change crystals, filters, and you're on a new band. The components exchanged are the two capacitors and the coil on the pi network (the circuit to which the antenna and ground directly attach). The caps are all silver mica, and the wire for the coils is #22. One could easily build the filters into plug-in units, changing them as you change bands.

| Band | Filter Caps | Filter Coil |
|---|---|---|
| 20m | 220pF | 21 turns |
| 40m | 470pF | 14 turns |
| 80m | 860pF | 10 turns |

*Fig. 3. Values of the pi-network LCs for 20, 40, and 80m.*

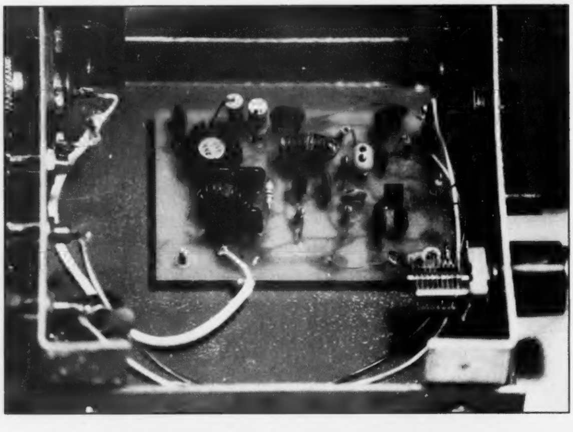


*Photo A. Inside the transmitter.*

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CIRCLE 92 ON READER SERVICE CARD

# 73 INTERNATIONAL

*edited by Richard Phenix*

### NOTES FROM FN42

*We now have an official Olympics '88 correspondent (see Republic of Korea, below). Any amateur radio Olympics information will be welcome here, however, to be shared with all readers. Mark envelope for 73 International.*

*A report from VP2MO, printed below, was received with pleasure—it had been some time since he last wrote—and his absence was explained in a casual and offhand manner. He has been busy "fitting into my new position," which turns out to be one newly created to handle all of the "day-to-day matters pertaining to telecommunications" and reporting directly to the Minister of Communications and Works. This includes, of course, all amateur radio matters. Congratulations to VP2MO!*

*Four National Days in November: 1—Algeria and Antigua, 19—Oman, and 24—Zaire; five Independence Days: 3—Panama, 18—Morocco, 22—Lebanon, 25—Suriname, and 28—Albania.*

*Other notable days for you to mention when you make those DX contacts: 3—Culture Day, Japan; 4—Flag Day, Panama; 5—First Cry For Independence Day, El Salvador; 6—Green March Day, Morocco; 7—October Revolution Day, USSR; 8—Queen's Birthday, Nepal, and Remembrance Day in Great Britain. It is Remembrance Day in Canada on the 11th (which is Veterans Day, USA, and Armistice Day in France), and in Bermuda on the 12th.*

*On the 14th it is Dynasty Day in Belgium; 15—Volkstrauer Day, Germany, and Proclamation of the Republic Day, Brazil (and the same in Yugoslavia on the 29th); 17—Army Day, Zaire; 20—Revolution Day, Mexico; 23—Labor Thanksgiving Day, Japan; and the 24th is Thanksgiving in the USA.*

### ROUNDUP

**Australia.** Time for the A.L.A.R.A. Contest again. (NOTE: Australians: Use locally issued instructions for additional necessary details!) Everybody eligible; YLs work everyone, OMs work YLs only; combined phone and CW, 0001 UTC through 2359 UTC November 14, suggested frequencies 28.100–28.350, 21.100–21.200, 21.350–21.370, 14.060–14.235, 7.100–7.120, 3.525–3.590. Each station may be counted twice on each band (once for phone, once for CW); no net or list operation, no crossmode. Contacts must be in accordance with operator and station license regulations. Call CQ ALARA CONTEST (phone), and on CW YLs call CQ TEST ALARA and OMs call CQ YL. Exchange: RS or RST, serial number beginning with 001, name; ALARA members add ALARA member before name. Logs: Single log entry, date/time (UTC), band, mode, callsign worked, RS(T) & Serial No. sent, ditto received, name of op worked, points claimed. Scores: 5 points for ALARA member contacted (logged, for SWLs); 4 for YL non-member contacted (logged); 3 for OM contacted. Double all points for CW contacts. Must sign logs, showing your full name, callsign and address; no carbons, must be legible; logs will not be returned. Contest Manager decisions final. Logs must be received by December 31, 1987, by Mrs. Marlene Perry VK2KFQ, 31 Cadell St., Wentworth 2648, N.S.W., Australia. A trophy will be given for the highest aggregate score over 5 years (1983 on) of any licensed YL op. Certificates for top scores: overall; Australian YL Novice CW; ALARA member each country and VK call area; YL non-member, each continent; OM, each continent; VK Novice; overseas YL Novice CW.

**Brazil.** Anyone lucky enough to have worked Steve NN7X/PY1ZBH from last July 1 to 10 from his DX location on Fernando de Noronha should QSL by SASE to PY1ECL, 86/87 *Callbook*, according to PY1CC—another report from whom will be published soon. He covers the F de N DXpedition.

**China.** John E. Felber K2BPR of *International Intertrade Index* sends us this picture of himself at the key of B7MC, aboard the *M.V. Yangzijiang* (Yangtze River) at Chongqing, with Cai Chu-ming, of Shanghai's BY4AA radio club. The rig is a 200 Watt CW on 6.5 MHz.

*John Felber K2BPR, in China.*

Chang Han Dong, our People's Republic of China correspondent, reports that he now IDs himself on the air (BY4AOM and other stations) as Hans. He reports also that he had a surprise gift from the ARRL—it has made him an Associate Member for a year ending next July. He thinks maybe the honor came to him as a result of his becoming a correspondent with us, and says "Please be sure to send my heartfelt gratitude to the ARRL." Another report from Han Dong will be published soon.

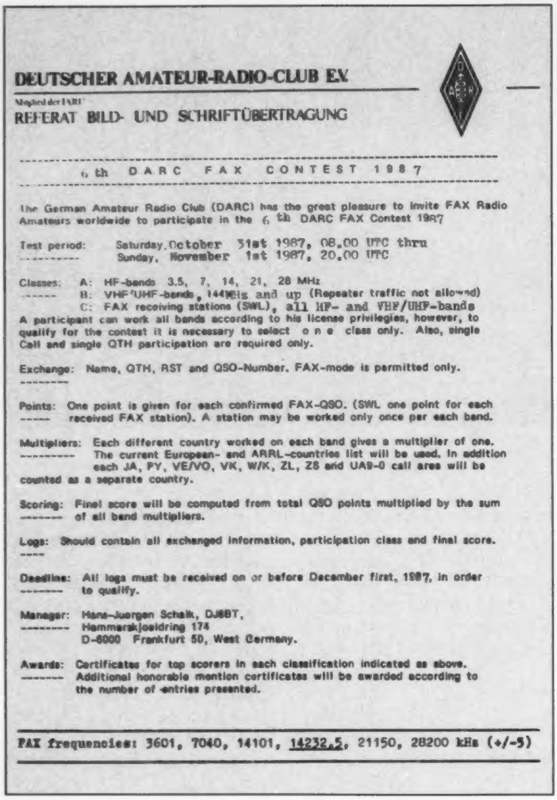
**Germany.** Hans-Juergen Schalk DJ8BT sends us information about the 6th DARC FAX Contest. See box on page 94.

**Great Britain.** *Shortwave Magazine* carried a four-page story on "The Biggest Radio Event In The World" in its July issue—"The Dayton Hamvention 1987," by Rev. G.C. Dobbs G3RJV. It was more than the title suggests: G3RJV did his homework and gives a delightful account of the history of the event as well as a complete description of the 1987 version. It also is complimentary. "In doing or seeing what I wanted, I was never defeated by lack of information or advice, just weariness."

**Greece.** Dr. Agis Sarakinos SV1ACS/W5WB invites "anyone in the USA who speaks Greek to join us [a group of former US hams now living in Greece] on 14285 kHz every afternoon 1700–2200 Greek time." He also asks associations of hams with common interests (handicapped hams, Rotary, Masonic, Boy Scout, Red Cross, etc. hams) to get in touch with him. Write him at the National Technical University of Athens, 4 Chiou, Chalandri, Athens, Greece 15231.

**Ireland.** Representatives from EI also reported favorably on the Dayton event in the newsletter of the Irish Radio Transmitters Society (PO Box 462, Dublin 9, Ireland). The address is given in case any ham club officer (or member) wants to send for the *IRTS Yearbook* for 1987/8 to see an outstanding example of what a club can do on behalf of the hobby in general and its own members in particular. 5-1/2" x 8-1/2" on glossy stock, 50 pages are devoted to IRTS information (regions, license information, visitor licenses, awards and winners, affiliated clubs' reports, the emergency network, contest and field day rules, QSL services, repeaters, band plans, and IRTS personnel, programs, and reports.) It is clear that new and potential hams are welcomed and get help from the IRTS. (The last 50 pages list EI callsigns.) If you want to take a stab at sending your money for one, figure out the equivalent in your currency for four pounds—3 pounds 50 pence for the book and 50 pence for postage (surface mail). Or write first—they may not have extra copies available.

The September issue lists recommendations to Region I, IARU, some of which are: For Packet Radio a frequency shift of 200 Hz should be used for 300 baud transmissions using FSK; for FM AFSK Packet Radio at 1200 baud, audio frequencies of 1200 and 2200 Hz should be used, as in the Bell 202 standard; the following footnote shall be included in the Standard for Digital Communications: "It is recognized that in the future higher data rates will be achievable through the use of different modulation methods. It is recommended, however, that in all cases for the frequencies used for communication between the user and a network access point, the bandwidth of the transmission



**DEUTSCHER AMATEUR-RADIO-CLUB E.V.**

Mitglied der IARU

REFERAT BILD- UND SCHRIFTÜBERTRAGUNG

6 th DARC FAX CONTEST 1987

The German Amateur Radio Club (DARC) has the great pleasure to invite FAX Radio Amateurs worldwide to participate in the 6 th DARC FAX Contest 1987

Test period: Saturday, October 31st 1987, 08.00 UTC thru
Sunday, November 1st 1987, 20.00 UTC

Classes:
A: HF-bands 3.5, 7, 14, 21, 28 MHz
B: VHF/UHF-bands, 144MHz and up (Repeater traffic not allowed)
C: FAX receiving stations (SWL), all HF- and VHF/UHF-bands

A participant can work all bands according to his license privilegies, however, to qualify for the contest it is necessary to select one class only. Also, single Call and single QTH participation are required only.

Exchange: Name, QTH, RST and QSO-Number. FAX-mode is permitted only.

Points: One point is given for each confirmed FAX-QSO. (SWL one point for each received FAX station). A station may be worked only once per each band.

Multipliers: Each different country worked on each band gives a multiplier of one. The current European- and ARRL-countries list will be used. In addition each JA, PY, VE/VO, VK, W/K, ZL, ZS and UA9-0 call area will be counted as a separate country.

Scoring: Final score will be computed from total QSO points multiplied by the sum of all band multipliers.

Logs: Should contain all exchanged information, participation class and final score.

Deadline: All logs must be received on or before December first, 1987, in order to qualify.

Manager: Hans-Juergen Schalk, DJ8BT,
Hammarskjoeldring 174
D-6000 Frankfurt 50, West Germany.

Awards: Certificates for top scorers in each classification indicated as above. Additional honorable mention certificates will be awarded according to the number of entries presented.

FAX frequencies: 3601, 7040, 14101, 14232.5, 21150, 28200 kHz (+/-5)

should not exceed 12 kHz, i.e., the bandwidth of an FM channel with 25-kHz spacing. For links between packet network nodes, higher data rates and larger bandwidths may be used. For such high speed (greater than 1200 baud) links, FM AFSK is not preferred." With respect to bandplans: In the "usage" section of the 144 MHz bandplan, the section 144.625 to 144.675 MHz shall be designated "Digital Communication." AFSK FM modulation shall be allowed in this section....In the "usage" section of the 432 MHz bandplan, the following sections shall be designated "Digital Communication": 430.600–430.800 MHz, 433.625–433.775 MHz, and 438.025–438.175 MHz....145.225 MHz (S9) shall be added to the 144-MHz bandplan as an FM simplex frequency.

**Italy.** 10 meters is coming back, and Mario Ambrosi I2MQP, now Secretary General for the Italian Amateur League [*Many congratulations!*] reminds us about the IY4M Beacon Robot—the Marconi Memorial Beacon Robot. For full particulars, see this column in the February, 1987, issue of this magazine, where DJ3NW of West Germany did a fine reporting job.

Manuel F. Calero I4CMF of the IARS Reciprocal Licensing Unit (Via Giorgione, 16–40133 Bologna, Italy) tells us of the first reciprocal agreement to be signed with a country in Central and South America: Venezuela. He also sends "Terms and Conditions" for temporary licenses for foreigners, effective July 1987. Too long to report on here, they may be obtained from the address given above or, more rapidly, from the ARRL in Newington.

**U.S.S.R.** An historic publishing agreement has been reached between the U.S.S.R State Committee for Publishing and Printing and the International Data Group (IDG—parent company of Wayne Green Enterprises) of Framingham, Massachusetts. *PC World U.S.S.R.* will be published beginning in early 1988 as a joint operation of Radio i Svyaz and IDG Communications. This is a pioneer implementation of the Supreme Soviet Decree of January, 1987, on joint ventures. As the world's leading publisher of computer-related newspapers and magazines (90, in 33 countries), IDG states that its 14 million readers will benefit by direct access to information about the progress of technology in the U.S.S.R. The PC market in the Soviet Union is expanding rapidly. For example, over a million microcomputers will be sold in the Soviet school system in the next three years. IDG's Axel Leblois said, "There is clearly a serious commitment in the Soviet Union to enact economic reforms, and to build successful relations with foreign partners."

**Zimbabwe.** Jamboree of the Air operators note: 1987 is the 75th Anniversary of the Girl Guide movement, so JOTA stations will, no doubt, give this event attention; watch for Zimbabwe.

The new Z2 Award is now available. All DX stations work 5 Z2s; Zone 38 stations work 10; Z2 stations work 15. Any band, any mode. Send US$1.00 or 10 IRCs with certified log extract (no QSLs) to Z2 Award, PO Box 2377, Harare, Zimbabwe.

### BRITISH WEST INDIES
### MONTSERRAT

*Errol "Bobbie" Martin VP2MO*
*PO Box 113, Plymouth*
*Montserrat, British West Indies*
*Leeward Islands, Zone 8*

### CHANGES IN VP2M-LAND

*As mentioned in the Roundup section, above, VP2MO is now the officer in the Ministry of Communications and Works who is responsible for all ham radio matters.*

With ham license matters now the responsibility of one man rather than one of several responsibilities of one individual, processing and dealing with amateur radio matters has markedly improved, and it is the intent of the Administration to continue its good relationship with the amateur radio fraternity at large.

It has been noted, however, that many persons have been using Form "A" for applying for a permit to operate here. This should be discontinued, and the proper form used. [*See illustration to guide your creation of a dated letter of application if you have no form*]. Under #8, list only the other callsigns you may now possess—not one that you want. Use space at the bottom of the form for any special requests.

Mail the application along with two recent passport-type photos, a photocopy of the present license held, and a bank draft or bank-certified check for "the amount of approx. US$7" made out to "The Accountant General." Be sure to allow enough time so that you have your license to operate *before you leave on your trip here.* This is important, particularly if you are bringing in any gear. Allow more than a theoretical minimum of two months. The longest part of the process is waiting for the check to clear—treasury regulations require this. [*Editor's Note: Why not risk eight bucks cash, indicating in your correspondence that you have done so? The risk is small, you'll get your change, and save a big slice of time. This is free advice—so feel free not to take it!*]

About obtaining a VP2M callsign: The fact remains that it is the intent of our local administration to preserve all resident callsigns, but there is no hard and fast rule. Each application will be reviewed and dealt with on its own merits. Unlike other independent countries, we have only the one prefix, so differentiating between residents and visitors we have only the option of the portable, which is a common way of doing it, internationally. We do tend to favor granting a VP2M call, however, for visitors who come here regularly for contesting, for example. We can appreciate wanting to have the feeling of "being a part of" some other country by having a resident callsign.

On the other hand, look at our licensing system. All licenses expire every December 31st and have to be renewed *at the beginning of the next year.* (So do drivers' and other licenses.) So, since January 1 is a holiday, and licensing offices are closed, operating (or driving, etc.) is technically illegal. If we operate on that day without a valid license is it legal? If anyone works a VP2M station on that day and gets a QSL card, is in valid for DXCC? You bet your ever-loving COAX it is!

The licensing authorities are aware of the situation and allow it to continue. To allow is to permit, right? And does this administration have anyone else to satisfy besides itself? Hell, no, and it couldn't care less what anyone else thinks. The administration has NOT declared anything about this operating to be illegal. Understand?

*VP2MO's report will be continued in a future issue. He shares his feelings that hams everywhere*

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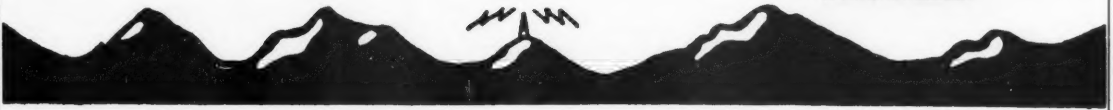

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______________________DATE

1. Applicant's name:
2. Home address:
3. Birthdate:
4. Place of Birth:
5. Nationality:
6. Evidence: [Copy of passport or birth certificate]
7. Class of amateur license held:

______________________CALLSIGN

8. Do you hold any other station license? List: [See text]
9. Proposed station location on Montserrat:
10. Amateur band(s) proposed for use:

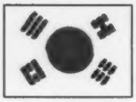
______________________Modes

______________________Maximum input power

11. Description of radio equipment which will be brought to Montserrat or used:
12. Estimated time of arrival:

I HEREBY DECLARE THAT THE ABOVE IS A TRUE STATEMENT, THAT I UNDERSTAND AND WILL ABIDE BY ALL LICENSE TERMS, PROVISIONS, CONDITIONS, AS PER RULE 3 OF THE TELECOMMUNICATIONS ACT OF 1949—REVISED EDITIONS OF THE "LAWS & ORDINANCE CAP 192 OF 1959 OF MONTSERRAT."

Name of Applicant (print or type)
Signature of Applicant
Date



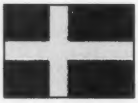
## REPUBLIC OF KOREA

*Byong-joo Cho HL5AP*
*PO Box 4, Haeundae*
*Pusan*
*Korea 607-04*

*We are naming HL5AP as a Special Olympics-88 Correspondent for this column; his callsign for the period of the games will be HL88AP. (For more information about HL5AP see this column for April, 1987.) Following is his first dispatch to us.*

The Ministry of Communications (MOC) of the Republic of Korea (ROK) has made the following pronouncements: The basic objective of amateur radio station support for the 1988 Olympics will be to provide mobile operation of HL8N, HL8A, and HL8V at Olympic Hall, Olympic Village, and the Stadium. From September 1 to October 5, 1988, HL8N will use the call 6K88SOG (Seoul Olympic Game), HL8V will use 6K88KOG (Korea Olympic Game), and HL8A will use 6K88A for special operations.

Other club and individual stations may use 88 in their calls. Any holders of amateur licenses can operate with those three stations for communications back to their own countries (QSP). Other HL stations that have registered with the Central Office can transmit to communist countries except for North Korea, but only Olympics information may be transmitted.



## SWEDEN

*Rune Wande SM0COP*
*Frejavagen 10*
*S-155 00 Nykvarn*
*Sweden*

### 29 MHZ FM REPEATERS

Communication through the help of repeaters in Sweden is now a reality on the 10-meter amateur band. The Swedish licensing authority has approved six repeaters on a trial basis up to December 31, 1988. So far there are only two separate pairs of frequencies for them. Receiver (RX) input is either 29.560 or 29.580 kHz, and the transmitter (TX) is 100 kHz higher, 29.660 or 29.680 kHz.

The repeaters in Sweden (also on VHF) are identified by the club prefix, SK, followed by the number for the call area and the letter R. The last two letters in the suffix identify a specific repeater. (A similar call, but with the prefix SM—e.g., SM5RKN—would belong to a private ham operator.)

The SK5RKN 29-MHz FM repeater has been in operation since April, RX 29.580 and TX 29.680. The RX locator is JO89JK and the TX is JO89KK, which is just outside the city of Strangnas at the Lake of Malaren. They are interconnected by 1,000 meters of telephone wire. TX power is 73-Watt input and the RX includes the In-Channel Select (ICS) system for excellent separation of channels and increased sensitivity. This repeater is run by the radio club, Eskilstuna Sandaramatorer SK5LW.

Other repeaters in operation are SK6RIC (29.560 / 29.660) run by Vasa Radio Club SK5DG in Alingsas, and SK6RFQ (29.580 / 29.680) in Gothenburg, both on the southwest coast of Sweden. To activate these repeaters, you need a 1750-Hz tone. Try to whistle—that should work, too.

*(SM0COP's report will continue next month.)*

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# PROPAGATION

Jim Gray W1XU

## EASTERN UNITED STATES TO:

| GMT: | 00 | 02 | 04 | 06 | 08 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 14 | 7A | 7 | 7 | 7 | 7 | 7A | 14 | 14 | 14 | 14 |
| ARGENTINA | 21 | 14 | 14 | 7A | 7 | 7 | 7A | 14 | 14A | 21A | 21A | 21 |
| AUSTRALIA | 21 | 14 | 7A | 7B | 7B | 7B | 7 | 7 | 7 | 7B | 14 | 14A |
| CANAL ZONE | 14 | 14 | 7A | 7 | 7 | 7 | 7A | 14 | 14 | 14 | 21 | 21 |
| ENGLAND | 14 | 7A | 7 | 7 | 7 | 7A | 14 | 14 | 14 | 14A | 14A | 14A |
| HAWAII | 21 | 14 | 14A | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 21 |
| INDIA | 14 | 14 | 7B | 7B | 7B | 7B | 7A | 14 | 14 | 14 | 14 | 14 |
| JAPAN | 14 | 14 | 14B | 7B | 7B | 7B | 7B | 7B | 14B | 14 | 14 | 14 |
| MEXICO | 14 | 14 | 7A | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 14 |
| PHILIPPINES | 14 | 14 | 14B | 7B | 7B | 7B | 7B | 14B | 14 | 14 | 14 | 14 |
| PUERTO RICO | 14 | 14 | 7A | 7 | 7 | 7 | 14 | 14 | 14 | 14 | 14A | 14A |
| SOUTH AFRICA | 7 | 7 | 7 | 7 | 7B | 14 | 14 | 14 | 14A | 14A | 14 | 14 |
| U. S. S. R. | 7A | 7 | 7 | 7 | 7 | 7B | 14 | 14 | 14A | 14A | 14 | 14 |
| WEST COAST | 14A | 14A | 14 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 14A |

## CENTRAL UNITED STATES TO:

| GMT: | 00 | 02 | 04 | 06 | 08 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 14 | 14 | 7 | 7 | 7 | 7 | 7 | 7A | 14 | 14 | 14 |
| ARGENTINA | 21 | 14A | 14 | 7A | 7 | 7 | 7A | 14 | 14A | 21A | 21A | 21 |
| AUSTRALIA | 21 | 14 | 7A | 7B | 7B | 7B | 7 | 7 | 7 | 7B | 14 | 14A |
| CANAL ZONE | 21 | 14 | 7A | 7 | 7 | 7 | 7A | 14 | 14 | 14A | 21A | 21 |
| ENGLAND | 14 | 7A | 7 | 7 | 7 | 7 | 7A | 14 | 14 | 14 | 14A | 14 |
| HAWAII | 21 | 14 | 14A | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 21 |
| INDIA | 14 | 14 | 7A | 7B | 7B | 7B | 7B | 7A | 14 | 14 | 14 | 14 |
| JAPAN | 14 | 14 | 14 | 7B | 7B | 7B | 7B | 7B | 14B | 14 | 14 | 14 |
| MEXICO | 14 | 14 | 7 | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14 |
| PHILIPPINES | 14 | 14 | 14 | 7B | 7B | 7B | 7B | 14B | 14 | 14 | 14 | 14 |
| PUERTO RICO | 14 | 14 | 14 | 7 | 7 | 7 | 14 | 14 | 14 | 14 | 14A | 14A |
| SOUTH AFRICA | 7 | 7 | 7 | 7 | 7B | 7B | 14 | 14 | 14 | 14A | 14 | 14 |
| U. S. S. R. | 7A | 7 | 7 | 7 | 7 | 7B | 14B | 14 | 14A | 14 | 14 | 14 |

## WESTERN UNITED STATES TO:

| GMT: | 00 | 02 | 04 | 06 | 08 | 10 | 12 | 14 | 16 | 18 | 20 | 22 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| ALASKA | 14 | 14 | 7A | 7 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14 |
| ARGENTINA | 21 | 14A | 14 | 14 | 7 | 7 | 7 | 14 | 21 | 21A | 21A | 21 |
| AUSTRALIA | 21A | 14A | 14 | 14 | 7A | 7A | 7 | 7 | 7 | 7B | 14 | 21 |
| CANAL ZONE | 21 | 14 | 7A | 7 | 7 | 7 | 7A | 14 | 14 | 14 | 21A | 21 |
| ENGLAND | 14 | 7A | 7 | 7 | 7 | 7 | 7B | 7A | 14 | 14 | 14 | 14 |
| HAWAII | 21A | 14A | 14 | 14 | 7A | 7 | 7 | 7 | 14 | 14 | 21 | 21 |
| INDIA | 14 | 14 | 14 | 7A | 7B | 7B | 7B | 7A | 14 | 14 | 14 | 14 |
| JAPAN | 14A | 14A | 14 | 14 | 14B | 7B | 7B | 7B | 14B | 14 | 14 | 14 |
| MEXICO | 14 | 14 | 7A | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 14A |
| PHILIPPINES | 14A | 14 | 14 | 14 | 14B | 7B | 7B | 14B | 14 | 14 | 14 | 14 |
| PUERTO RICO | 14A | 14 | 7A | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 14A |
| SOUTH AFRICA | 7 | 7 | 7 | 7 | 7B | 7B | 7B | 14 | 14 | 14A | 14 | 14 |
| U. S. S. R. | 7B | 7B | 7 | 7 | 7 | 7 | 7B | 14B | 14 | 14 | 14 | 14 |
| EAST COAST | 14A | 14A | 14 | 7 | 7 | 7 | 7 | 14 | 14 | 14 | 14A | 14A |

**A = Next higher frequency may also be useful.**
**B = Difficult circuit this period.**

**First letter = night waves. Second = day waves.**
**G = Good, F = Fair, P = Poor. * = Chance of solar flares.**
**# = Chance of aurora.**

**NOTE THAT NIGHT WAVE LETTER NOW COMES FIRST.**

During many days of the month, be on the alert for VHF openings.

Expect HF conditions for the first two weeks of the month to be fair to poor. The geomagnetic field will be unsettled to active, with storm conditions possible on or near the 1st and 2nd, and again on the 9th and 10th.

The second two weeks of the month are likely to show improved conditions for HF propagation, with the geomagnetic field less active, except for the 23rd, 24th, and 25th, when conditions are likely to be poor again for the next few days.

In general, November is a good month for HF propagation with seasonal noise levels far below those of the summertime. Early darkness will insure excellent activity on the lower HF bands 160 through 40/30 meters during the evening hours, with 10 meters closing first. On some days, 15 and 20 meters will remain open into the late evening hours, local time.

### NOVEMBER 1987

| SUN | MON | TUE | WED | THU | FRI | SAT |
|---|---|---|---|---|---|---|
| 1<br>P | 2<br>P | 3<br>P–F | 4<br>F | 5<br>F | 6<br>F-P | 7<br>F |
| 8<br>F–P | 9<br>P | 10<br>P | 11<br>F | 12<br>F | 13<br>F-G | 14<br>G |
| 15<br>G | 16<br>G | 17<br>G-F | 18<br>F | 19<br>F–G | 20<br>G | 21<br>G |
| 22<br>F | 23<br>P | 24<br>P-F | 25<br>F | 26<br>G | 27<br>G | 28<br>F |
| 29<br>F-G | 30<br>G | | | | | |

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Factory authorized dealer! Yaesu, ICOM, Ten-Tec, KDK, Kenwood, AEA, Kantronics, Santec. Full line of accessories. No sales tax in Delaware. One mile off I-95. **Delaware Amateur Supply, 71 Meadow Road, New Castle DE 19720; 302-328-7728.**

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Kenwood, ICOM, Ten-Tec. Mon.-Fri. 9a.m.-6p.m., Sat. 9a.m.-5p.m. **TNT Radio Sales, 4124 West Broadway, Robbinsdale MN 55422 (MPLS/ST. PAUL); Toll Free 800-328-0250, In MN 612-535-5050.**

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# OP-ED

*by Larry Ledlow, Jr. NA5E*

## SO WHAT?

I used to be a not-so-humble civil servant. No kidding! Earlier this year I conducted a meeting in a microscopic, windowless conference room with three other bureaucrats: my boss, my boss' boss, and a fellow who wanted to be my boss. Frankly, I didn't want to work for *any* of them. No wonder I felt a little claustrophobic.

### The Turning Point

The meeting began innocently enough. I just wanted to tell everyone what a great job I had done on a project that held very little interest for me. You know. One of those I've-done-great-things-when-is-my-next-promotion meetings. Trouble popped up after about five minutes. My boss' boss—a fellow with an amazing overabundance of hair on his head—decided he didn't like the connotations of a particular phrase buried in a paragraph of a subpart of an attachment to the annex of the test plan. Stifling a yawn? So was I. "Right!" my boss said: "We'll change it right away." Then he went back to sleep. He really meant I would make the change.

I guess I missed something. I couldn't see why I had to change anything. "Why?" I simply asked. The explanation that followed stretched my imagination and patience to their outer limits. (I think that's why the head cheese had so much hair. He thought too much.) After fifteen minutes of struggling to follow a logically convoluted argument I just had one more question. "So *what?*"

Everyone sat back, stunned and eyes agog. The smallest man in the room licked his lips. He hoped his chance to get me under his thumb had come. It's that simple. Those six letters and just the right inflection, coupled with certain physical expressions for emphasis, marked a turning point in my previous life as a bureaucrat.

I didn't make the change. I didn't get promoted. I didn't go to work for the short man. I came to work for Wayne Green instead.

### Tips for Authors

Half the tale is in the telling. I know most of you don't supplement your income much by freelance writing, much less make a full-time job out of it. I have some pointers, though, that may help you make a sale or two with your manuscripts.

You probably wouldn't write something down if you didn't think it was interesting or exciting. You write an article because you want to share the information with lots of people, not to mention your desire for a few extra dollars. Make a list of the things that excite you about your subject and reasons other people may want to read about it. Then build that list into an introduction for your article. Make your points immediately and up front, or most readers won't slog through the rest of the text trying to find a redeeming feature. Emphasize unique features of a project or begin with an interesting anecdote. Grab your readers' attention immediately, or after a few paragraphs they'll ask, "So what?".

Pick your audience and stick to a particular level of delivery. Unless your subject has general interest, you're wasting time trying to write for the whole spectrum of readers. If you write about a project that any Novice can build, then stay with that level. If you write a tutorial on phase shift keying, then you probably want to aim a little higher. Two things will alienate readers faster than anything else: insulting their intelligence or writing far above their level of ability.

Make your delivery in a clear, concise manner. Lists, outlines, and good photographs or diagrams always help the reader visualize the subject. Avoid asides that may distract the reader.

### Let's Communicate!

You will see many fine changes on the pages of *73*, and I encourage would-be authors and long-time contributors to help us make these changes. If you have an idea for an article, please propose it in a letter with an outline. Call me on the telephone, and let's discuss your idea. I also recommend that you request a copy of our editorial calendar so you better understand our plans.

I expect you to find 1988 issues better than ever. We'll cover better construction topics but also humanize the hobby a bit more. Watch for issues focusing on satellites, digital communications, public service and education, packet, automatic control of your shack, trouble shooting, QRP, DX, antennas, propagation, and much more.

Drop me a line or give me a call. See you on the air, and hopefully in the pages of 73. ■

**Say you saw it in 73!**

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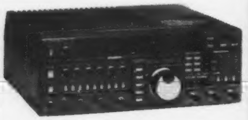

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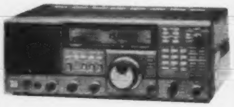

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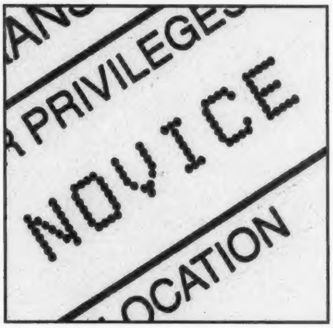
# You've made a great start. Now, let Yaesu really get you going.



Finally. The 220-MHz, 1.2-GHz, and 10-meter phone bands are open to Novice operation.

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**Tune in to Yaesu.** You've earned your ticket to the exciting world of amateur radio. Now, discover the exciting world of ham radio technology.

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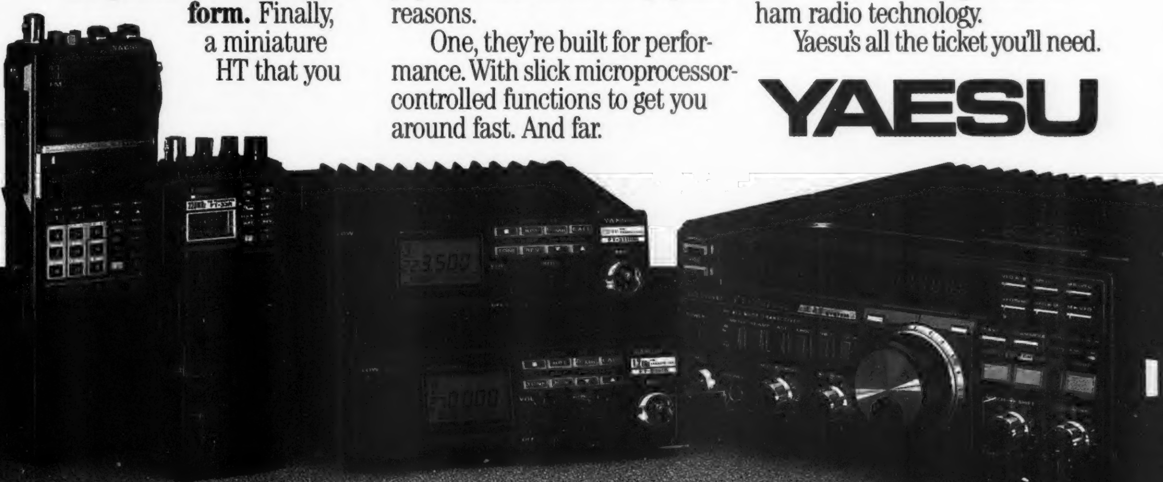

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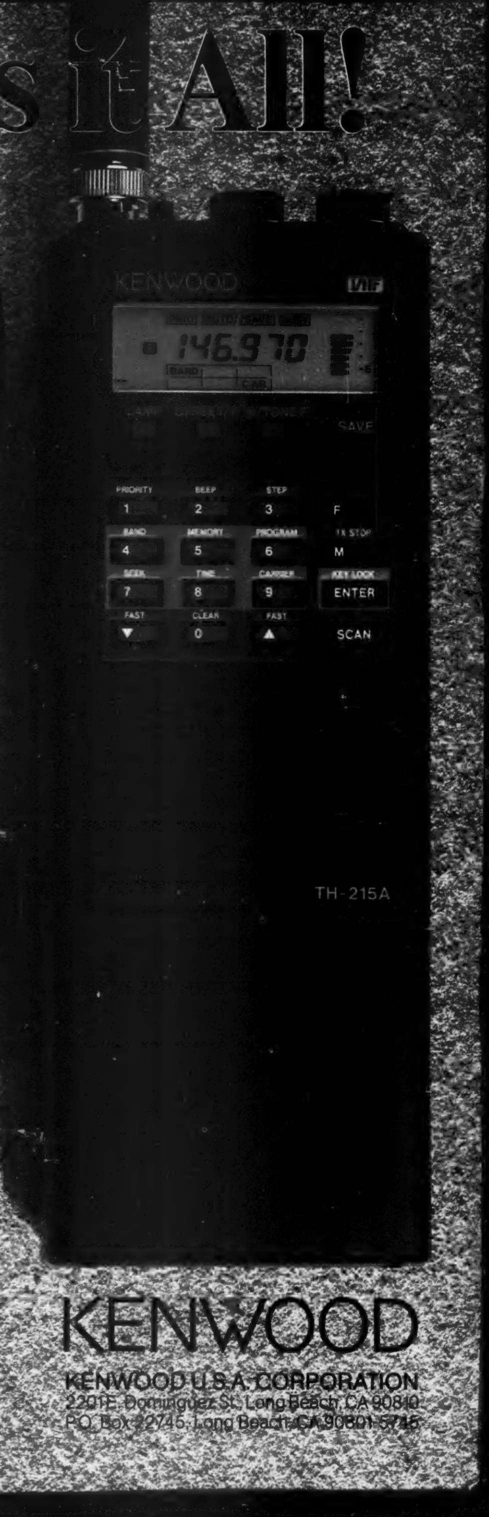

*Complete service manuals are available for all Kenwood transceivers and most accessories.*
*Specifications and prices are subject to change without notice or obligation.*

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